ELECTRICAL REVIEW

7 FEBRUARY 1958 PRICE 1s 6d

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An A.E.I. Company SIEMENS EDISON SWAN

a century of experience

No. 8 F Stanton Prestressed Spun Concrete Lighting Columns at Stockton-on-Tees.

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- LIGHTING COLUMNS

STANTON

Prestressed

Spun Concrete Lighting Columns

The above column is one of many Stanton designs approved by the Council of Industrial Design and acceptable to the Ministry of Transport for use on trunk roads.

Photograph by courtesy of J. Cowan, Esq., A.M.Inst.C.E., M.I.Mech.E., A.R.I.C.S., Engineer and Surveyor, Stockton-on-Tees.

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Heatrae

started something !

From the earliest days of Electric Heating, Heatrae Ltd. have collaborated with industry in meeting the growing demand for Electrically Heated Apparatus over a wide field of application.

Here are illustrated two typical types of heaters designed to meet particular conditions.

The top right-hand view is of a 60 kW Oil Heater: working pressure 50 p.s.i. It is fitted with a float switch which cuts off the electric supply should the oil level fall below safety limit.

All heat units are removable core type and can be replaced, if necessary, without interruption of service.

These heaters are made in a wide range of sizes and pressures, suitable for water, oil, Dowtherm, etc.

The bottom (left) illustration is of a 220-gallon heater for oil or Dowtherm. The working pressure is 100 p.s.i. Maximum temperature of 300°C. The heat units are of flame-proof construction.

Heatrae invite you to make use of their wealth of experience. Send details of your particular requirement. Their team of experts will endeavour to devise a satisfactory solution at the lowest possible cost.

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Established in 1920

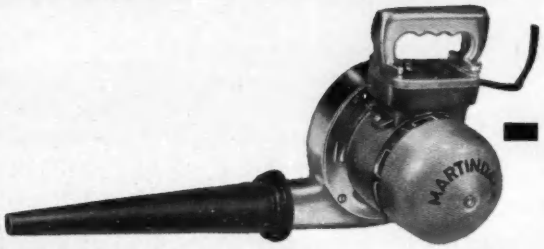
HEATRAE LIMITED NORWICH

Pioneers in All-British Electric and Steam Heaters for Industry

Manufacturers of: Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Flame-proof Heating Apparatus, Electric Fires, Food Trolleys, Warming Plates Air Heaters

L537.052

The NEW MARTINDALE Portable BLOWERS

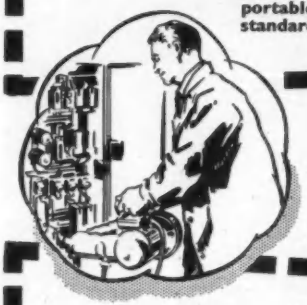


POWERFUL BLOWING

The powerful Martindale Blowers direct a stream of dust-removing air into every inaccessible crevice of electrical and other machinery, thus removing a common cause of short circuits and motor failures.

EFFICIENT SUCTION

All of the five blowers are instantly converted into portable industrial suction cleaners by the use of standard attachments at little cost.



HOT AIR DRYING

An independent Heater is available for attachment to the Blowers, which produces hot air for the quick drying of coils, transformers and for many other purposes.

THE "PORT-A-VAC"

The "Port-A-Vac" light-weight harness permits the Martindale Blower to be used as a powerful vacuum cleaner carried in comfort upon the operator's back leaving him free to climb ladders, etc., to clean out-of-reach parts of the factory.

"MARTINET" WET-DRY SUCTION PICK UP

With this amazing equipment any Martindale Blower is converted into a suction cleaner which picks up both *liquids* and *solids*, the liquids and dirt being deposited into the special tank and only the airborne dust into the filter bag.

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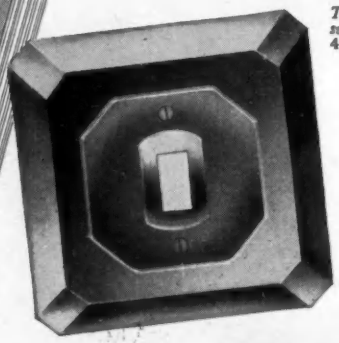
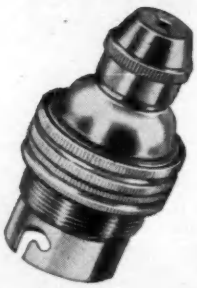
You'll find all the answers in Britain's most comprehensive electrical accessories catalogue

Tucker TELAC MEM KERSON

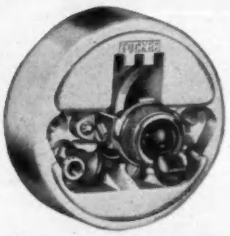
The 'Trent' range of 5 amp flush switches are available in 1, 2, 3 and 4 gang form.



'Trojan' Brass B.C. Lampholder.



'Titan' all-insulated B.C. Lampholder.



Open view of 'Tyne' heavy duty 5 amp tumbler switch.

'Tyne' heavy duty quick make and break tumbler switch.

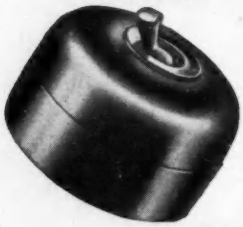


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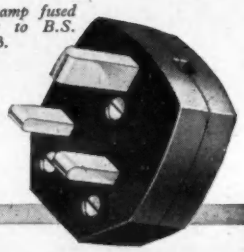
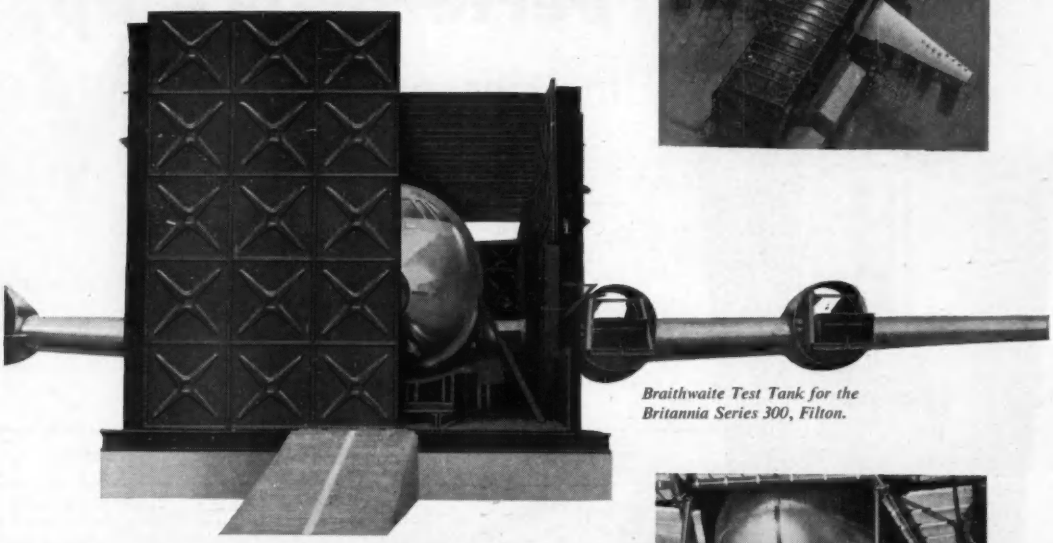
Plate and switch form a one piece unit in the Tay range of A.C. Flush Plate switches.

13 *amp fused plug to B.S. 1363.*

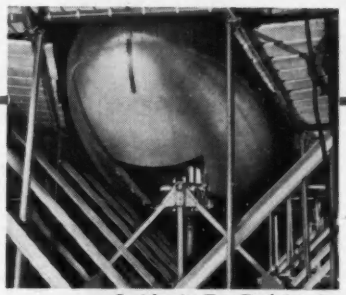


MIDLAND ELECTRIC MANUFACTURING CO., LTD., TYSELEY, BIRMINGHAM, 11

Braithwaite Test Tank for the Comet 2 and the new Comet 4, Hatfield.



Braithwaite Test Tank for the Britannia Series 300, Filton.



Braithwaite Test Tank interior for the Viscount, Weybridge.

Braithwaite & aircraft research

Four hours flight is simulated in four minutes at ground level, for the purpose of pressure-testing the fatigue life of prototype aircraft. We were honoured by the confidence shown in us and Braithwaite Pressed Steel Tanks when we were invited to design and construct the original test tanks used by the Royal Aircraft Establishment at Farnborough. Since then we have been privileged to receive the contracts for all such installations including a second for the Royal Aircraft Establishment and those supplied to such distinguished aircraft constructors as Bristol Aircraft Limited, the De Havilland Aircraft Company Limited and Vickers-Armstrongs (Aircraft) Limited.

'Comet,' 'Britannia,' 'Viscount,' all these famous aircraft have been subjected to safety tests and investigations in Braithwaite Pressed Steel Sectional Tanks.

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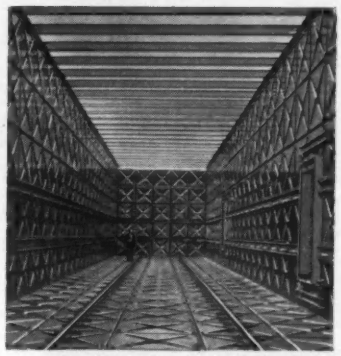
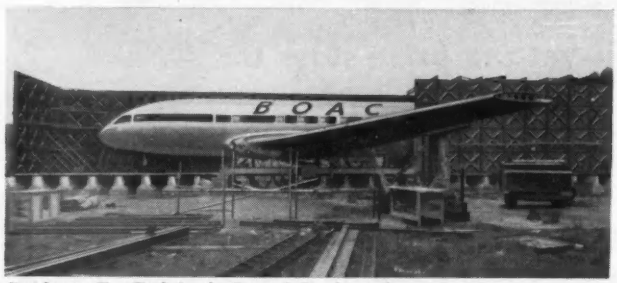


Braithwaite Test Tank interior for the Britannia Series 100, Farnborough.



Braithwaite Test Tank for the Comet 1, Farnborough.

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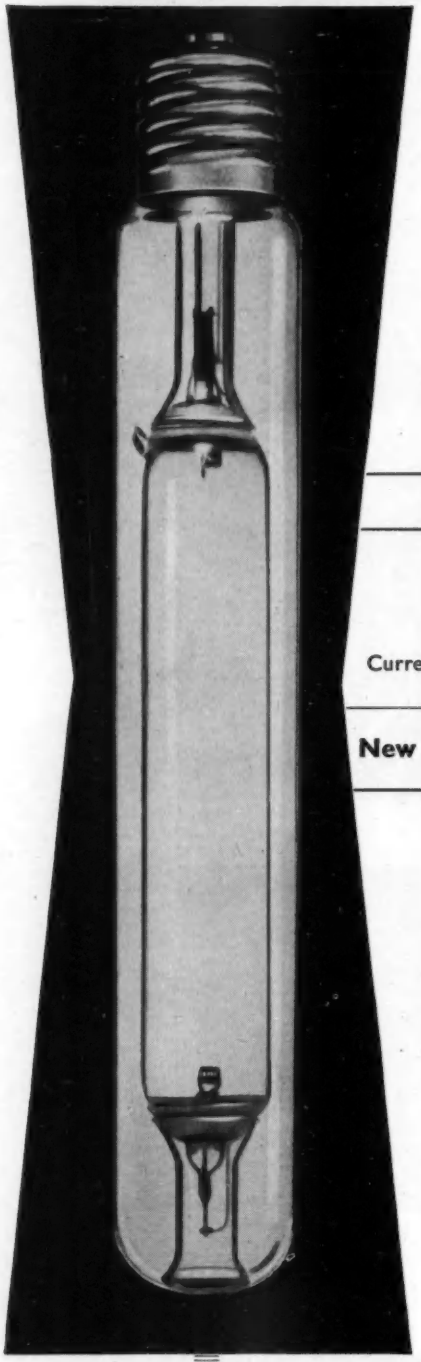
Manufacturers of Electric Lamps



Performance up

in light output and life!

—with the outstanding

CROMPTON

MERCURY DISCHARGE LAMP

THE FIGURES:	250 W.			400 W.		
	LUMENS PER WATT.			LUMENS PER WATT.		
	Initial	Thro' Life	Final	Initial	Thro' Life	Final
Current B.S. Spec.	35	31	29	42	34	31
New Crompton Lamps	**37**	**35**	**33**	**42**	**39**	**36**

THE FACTS:

More efficient — Besides increased overall light output, the new lamps, after **5000** burning hours, give approximately 15 per cent higher efficiency.

Simpler, stronger — All-round improvements in construction include elimination of ugly wire supports and vulnerable connections, and much higher resistance to shock in transit or usage.

—yet the price stays the same!

Don't say 'lamps'—

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"... now switch to

FORMICA*

industrial laminates!"

The electrical and mechanical laminates once famous as 'Delaron' (and 'Traffolyte' engraving and printed material too) will henceforth be known as FORMICA industrial laminates and FORMICA engraving and printed materials respectively. Why? Because the makers have changed *their* name—to Formica Ltd. FORMICA industrial laminates, giving exactly defined performances . . . FORMICA industrial laminates, backed by the most wide-awake research and development set-up in this field . . . FORMICA industrial laminates, with a Technical Advisory Service which ensures you get the grade you need, *even if it never existed before.*

Following the formation of the new company they've concluded an agreement for the exchange of technical information with the American Cyanamid Company—covering 25 years and this close link will be invaluable in widening their range, and accelerating technical progress.

FORMICA *industrial laminates*

paper, fabric, and glass-based laminates
Copper-clad. Engraving and printed material

* *FORMICA is a registered trademark*

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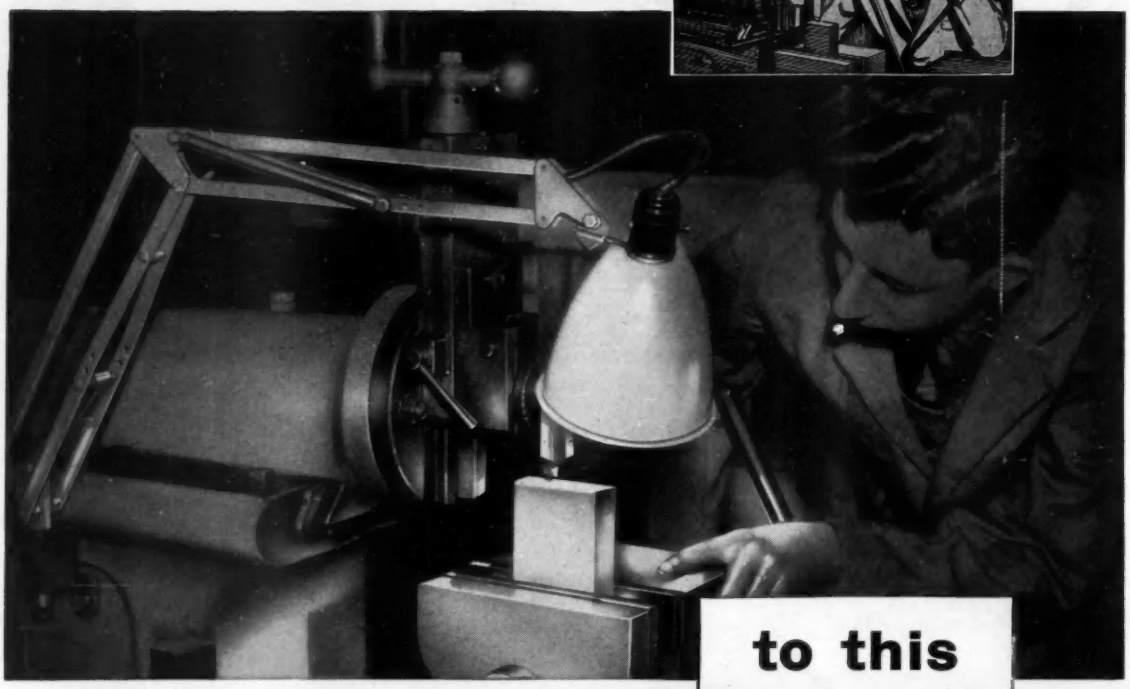

to this

and step up production . . .

For working within close limits, an Anglepoise is simply indispensable. However good a worker and his eyes may be, he must see the job. This applies in all fine work, drilling, assembling, etc., where instantly adjustable close-to-the-job lighting is a sheer necessity.

Anglepoise throws a clear, concentrated light right on and into the work, not in the operator's eyes, follows the job from any position or angle, degree by degree, at a finger-touch and 'stays put' in any required position—and out of the way when not needed. It needs only a low-powered bulb for high-class results—a big saving on the lighting bill (it can be supplied with a small shade for low voltage systems). Why not learn more about this fine lamp by sending for Booklet ER?

TERRY Anglepoise LAMP

Regd.

Sole Makers: HERBERT TERRY & SONS LTD · REDDITCH · WORCESTERSHIRE

*** A SUGGESTION FOR MACHINE MANUFACTURERS:—**

Why not fit your products with Anglepoise? We will submit samples on approval.

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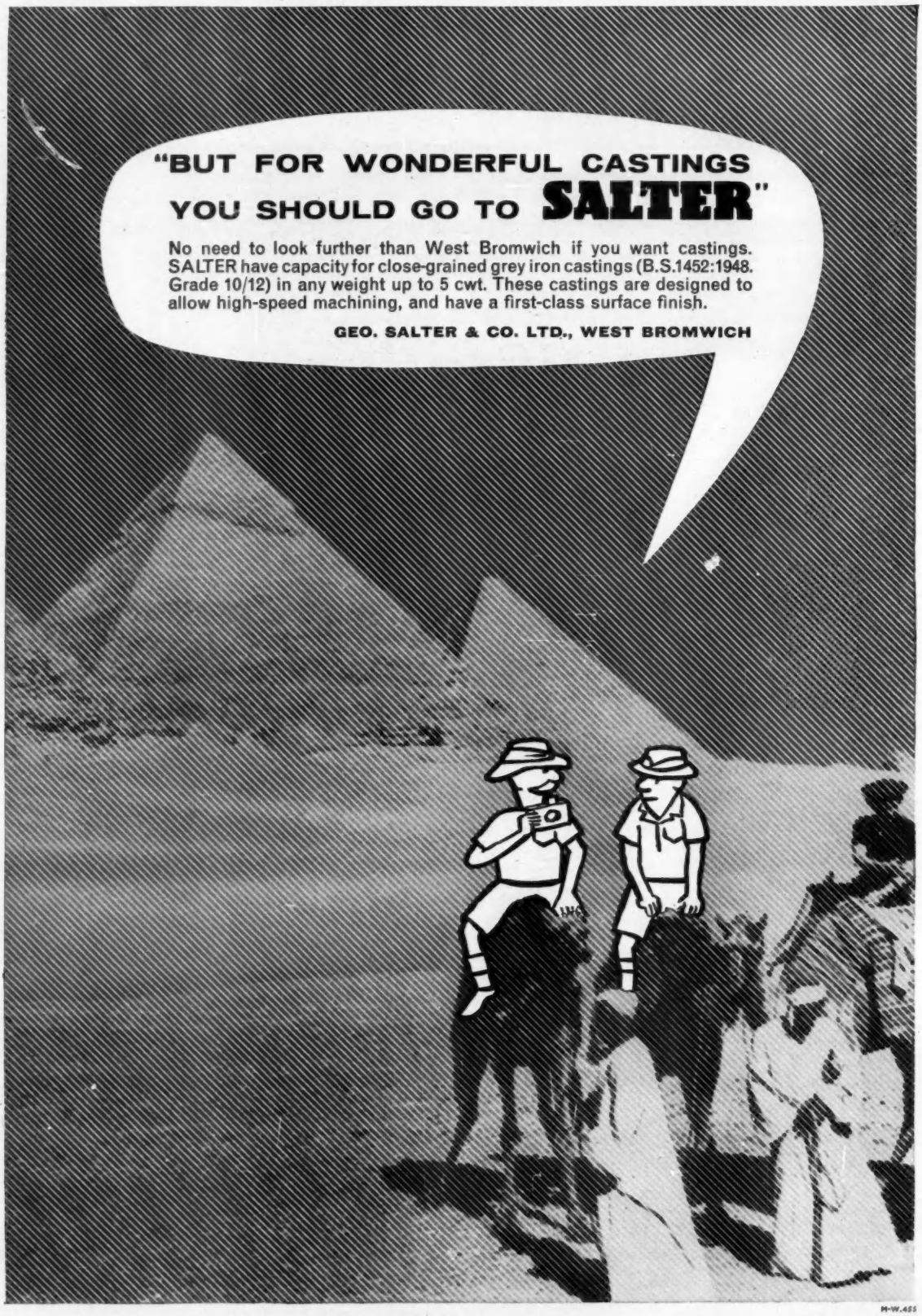
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No need to look further than West Bromwich if you want castings. SALTER have capacity for close-grained grey iron castings (B.S.1452:1948. Grade 10/12) in any weight up to 5 cwt. These castings are designed to allow high-speed machining, and have a first-class surface finish.
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safety first

with SIEMENS EDISWAN

earth leakage circuit breakers

Three types of earth leakage circuit breakers make up the Siemens Ediswan range of these established safety switches. Voltage operated and complying with B.S. requirements, they are of improved design and ensure a wide margin of safety. Tripping mechanism is simple and robust; cases and covers give good protection against heat, cold, damp, dust and insects. For full details, please ask for catalogue Z174/57.

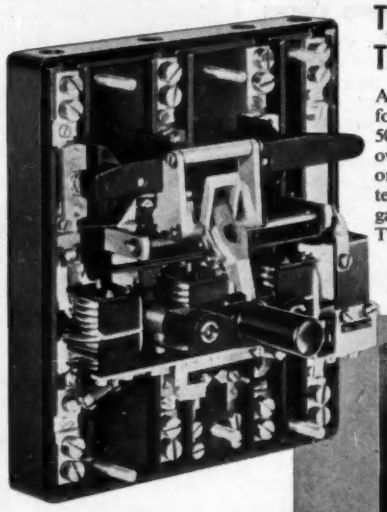
'Safetrip' Type EL15 Switch Socket

Suitable for 13/15 amp. 250v. circuit; complete earth leakage protection for domestic apparatus using up to 3 kw. Available also as switch only.

Type ET.60D Circuit Breaker

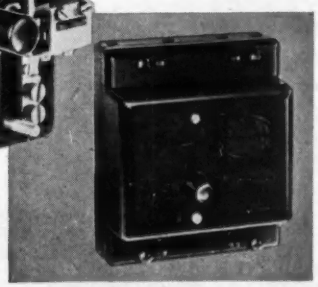
Suitable for 60 amp. 250v. circuit; for use as consumers' main switch in small dwellings, especially in rural areas, and for protection of farm equipment or industrial tools. Overload protection can be supplied, and extended terminal covers, fitted with rubber gaskets, are available for use with T.R.S. cable or conduit.

Pamphlet No. ST.2 gives details of Siemens Ediswan Monitored Earth Leakage Circuit Breaker Units for automatic switching off should the earth wires become disconnected or fractured.



Types TP and TP & N Circuit Breakers

A new addition to the range intended for industrial use; suitable for 60 amp. 500v. circuit. Available with or without overload coils on each phase, and with or without neutral link. Extended terminal covers, fitted with rubber gaskets, can be supplied for use with T.R.S. cable or conduit.



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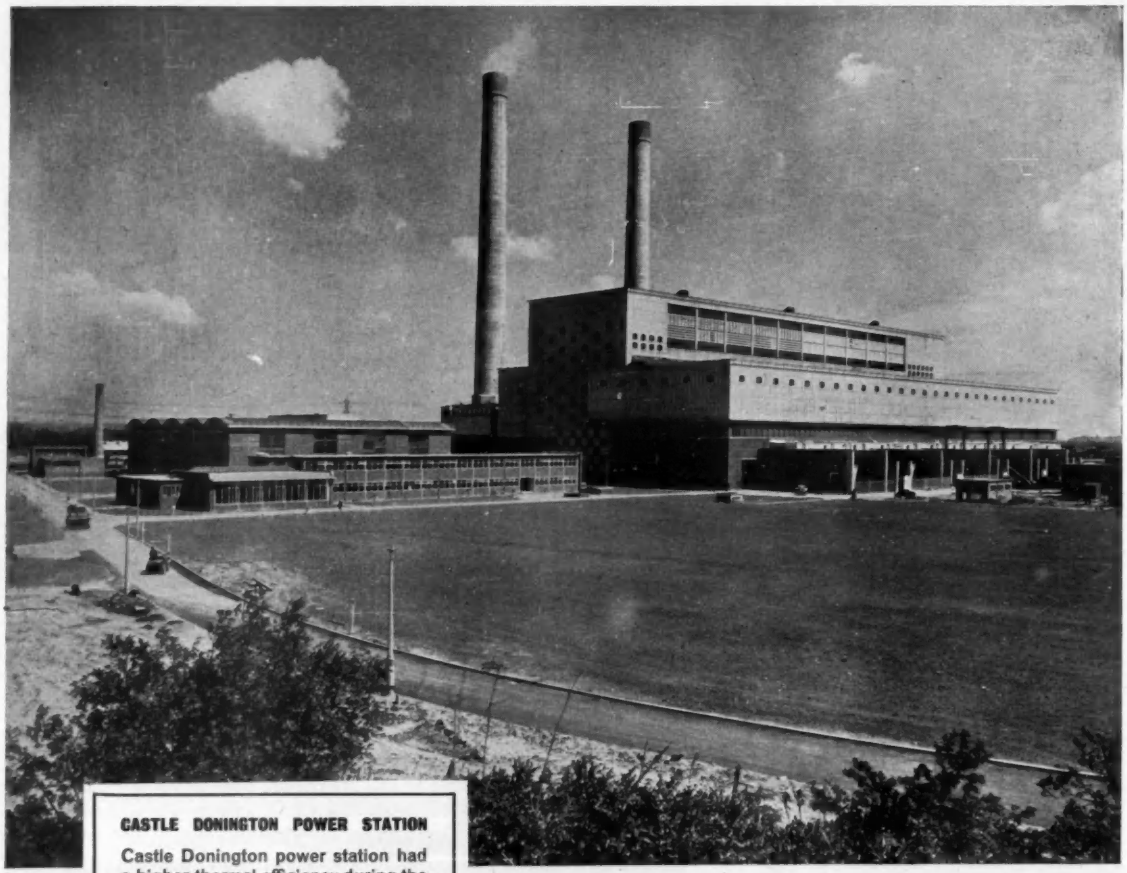
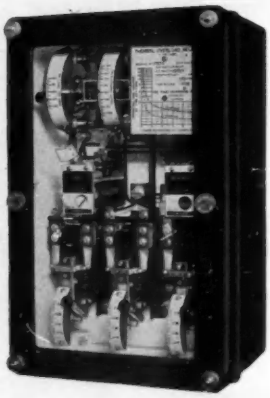


CASTLE DONINGTON POWER STATION

Castle Donington power station had a higher thermal efficiency during the year ended 31st Mar., 1957, than any other power station in Great Britain. The motors driving the auxiliaries are protected by P & B Golds relays in this and many other power stations of the Central Electricity Generating Board.

C·E·G·B chose P&B Golds protection



P & B Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.
P & B Golds Relays protect against phase failure, overload, short circuit or earth fault.
P & B Stalling Relays give complete protection against stalling under all conditions. Send for current literature.

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PROTECTION RELAYS

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MARCH 25th to 29th 1958

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MAGNETIC TACHOMETERS
1½" TO 12" DIAMETER

ELECTRIC TACHOMETERS
4" TO 12" DIAMETER

D.C. WATERTIGHT SPEED INDICATORS

THERMOMETERS AND PRESSURE GAUGES

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INDUSTRIAL "DESYNN"

REMOTE INDICATION OF ANGULAR POSITION, FLUID LEVEL, FORCE, LINEAR POSITION, DIFFERENTIAL PRESSURE AND PRESSURE

MARINE "DESYNN"

THERMOSTATS

"PETRO-FLEX"
FLEXIBLE TUBING

HAND MEASURING
WHEELS

HERMETICALLY SEALED
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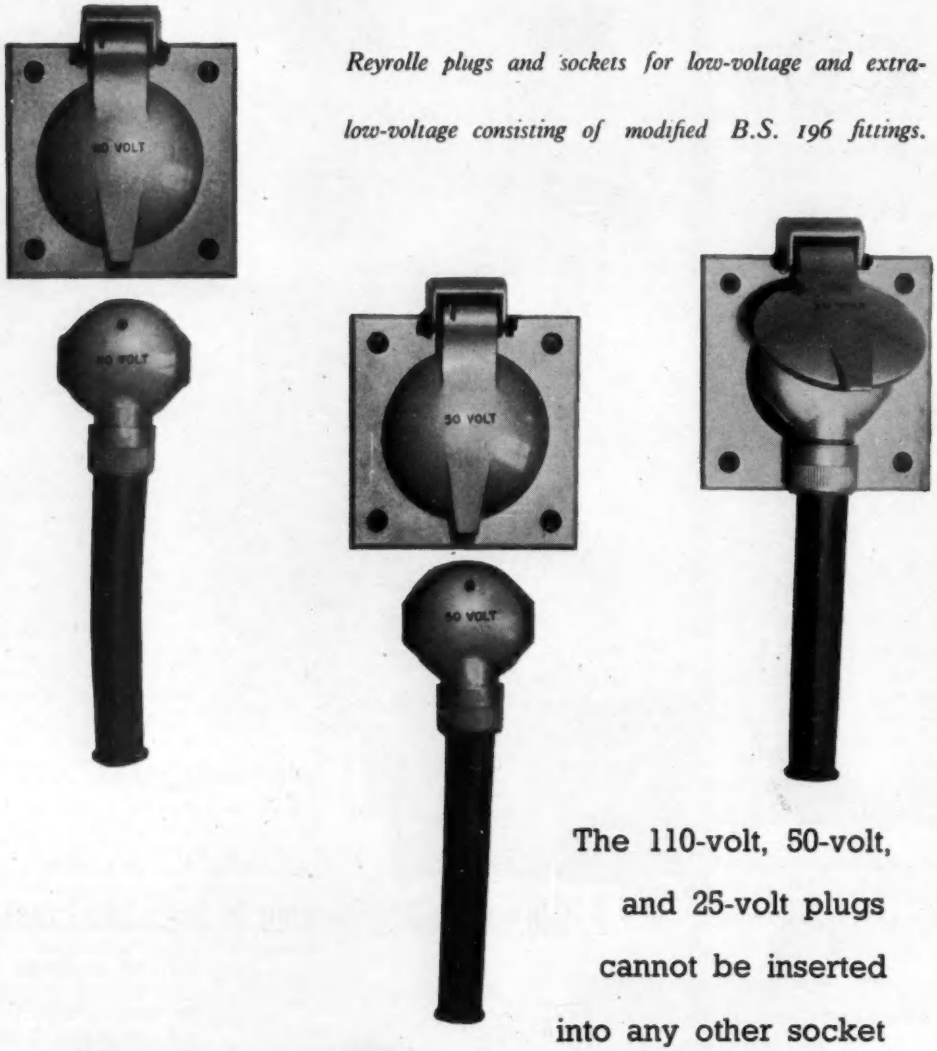
THE INDUSTRIAL INSTRUMENT DIVISION OF S. SMITH & SONS (ENGLAND) LTD.



Reyrolle plugs and sockets for low-voltage and extra-low-voltage consisting of modified B.S. 196 fittings.

Reyrolle

The 110-volt, 50-volt, and 25-volt plugs cannot be inserted into any other socket than that for which each is intended. The voltage indication on both plug and socket is an optional extra.

A. REYROLLE & COMPANY LIMITED HEBBURN COUNTY DURHAM ENGLAND

Ask for pamphlet No. 935.

and the same again please!

A repeat order for this Submarine Power Cable, worth $3,500,000, has been placed with the BICC Group.

A further 39 miles of 138kV submarine power cable is to be made and laid by the BICC Group from the mainland of British Columbia to Vancouver Island.

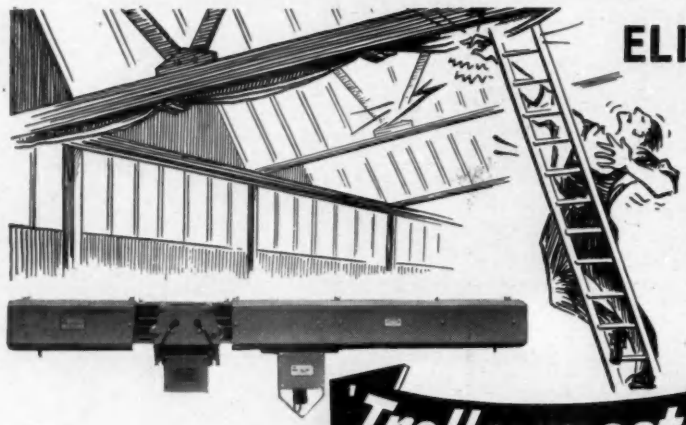
This contract, awarded by the British Columbia Electric Company, follows a year's successful operation of the existing power link which was supplied by BICC.

Again the cable will be made by BIC (Submarine Cables) Ltd., and laid by the BIC Construction Company, both members of the BICC Group.

BICC CABLES

THE name for cables-everywhere

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 Bloomsbury Street, London, W.C.1



ELIMINATE "OVERHEAD" RISKS

FOR SAFER MOBILE ELECTRIC POWER SUPPLIES USE THE..

'Trolleymaster' ENCLOSED COLLECTOR TRACK SYSTEM

Eliminate the risk of accidents by having your Electrical Power supplies totally enclosed in an accident proof casing and still have all the advantages of a power supply when and where you need it. The E.M.S. "TROLLEYMASTER" Enclosed Collector Track is a fool-proof system of moveable power distribution and is designed to reduce the danger from trailing flexible leads and exposed conductors.

Ideal for the supply of power to machines or equipment such as small mobile cranes and hoists, etc., it may be used to advantage on certain types of process work, and as many trolley collectors as required can be run from the same conductor rails. The "TROLLEYMASTER" is designed for 400 volt 3 phase supply with maximum load of 100 amps. per phase. It is supplied in 10 ft. lengths with a weight per foot of 7 lbs.

No matter what your requirements we can supply a mobile power supply designed to meet your needs.

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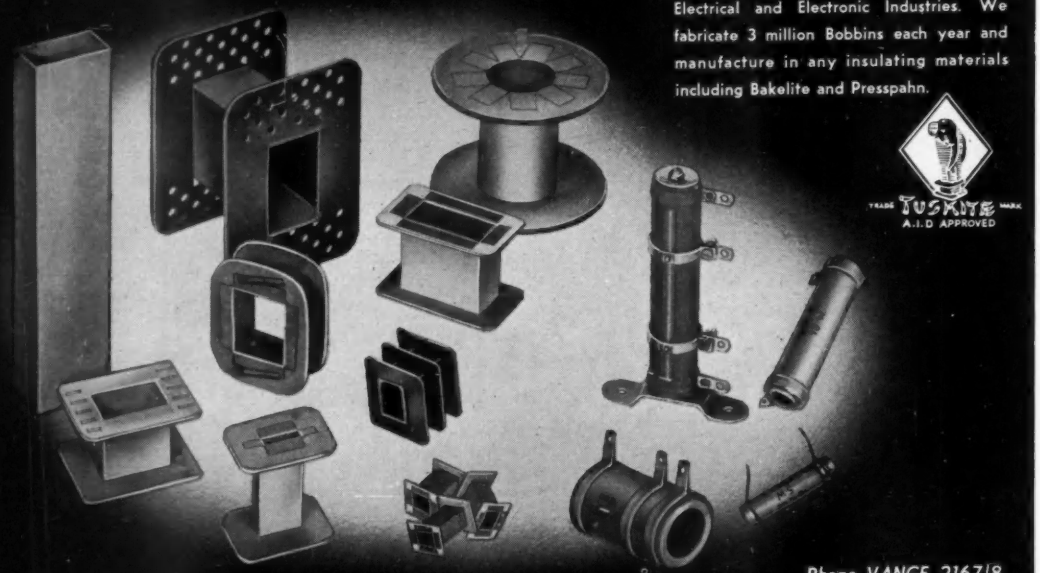

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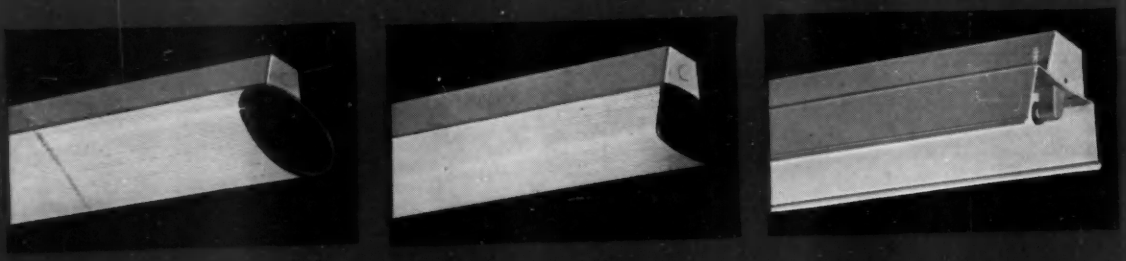

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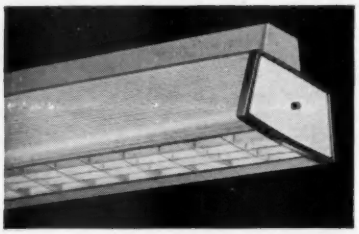

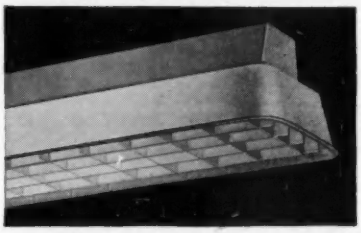

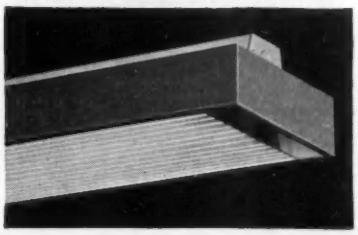

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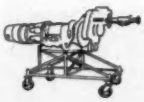

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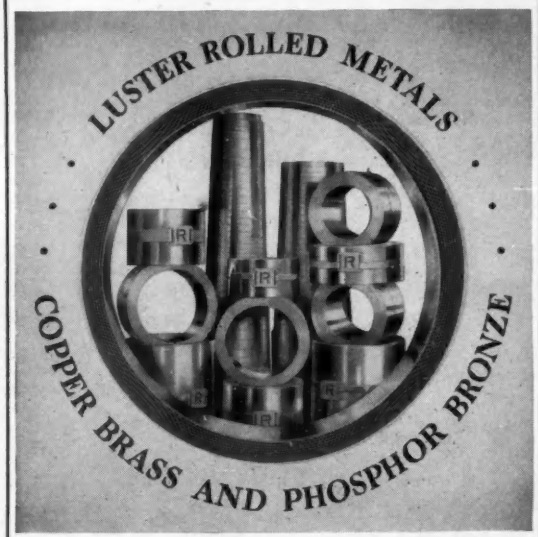

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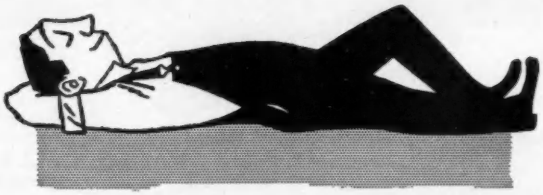

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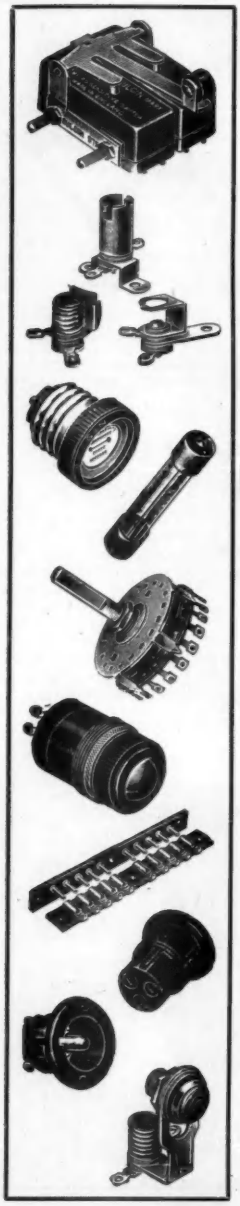

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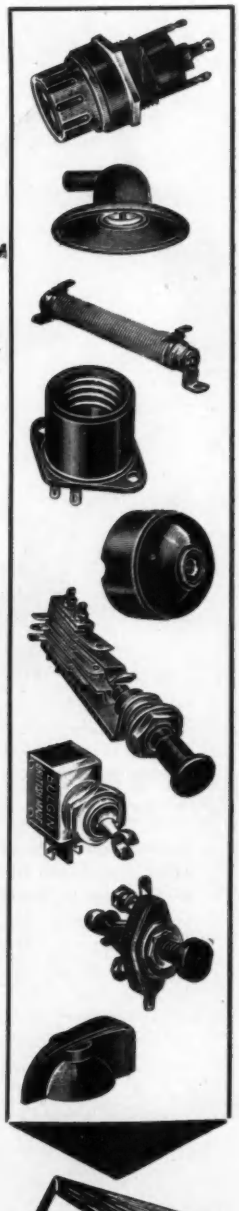

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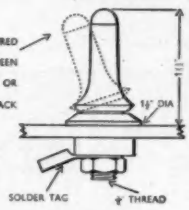

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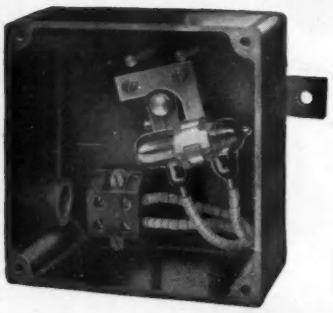

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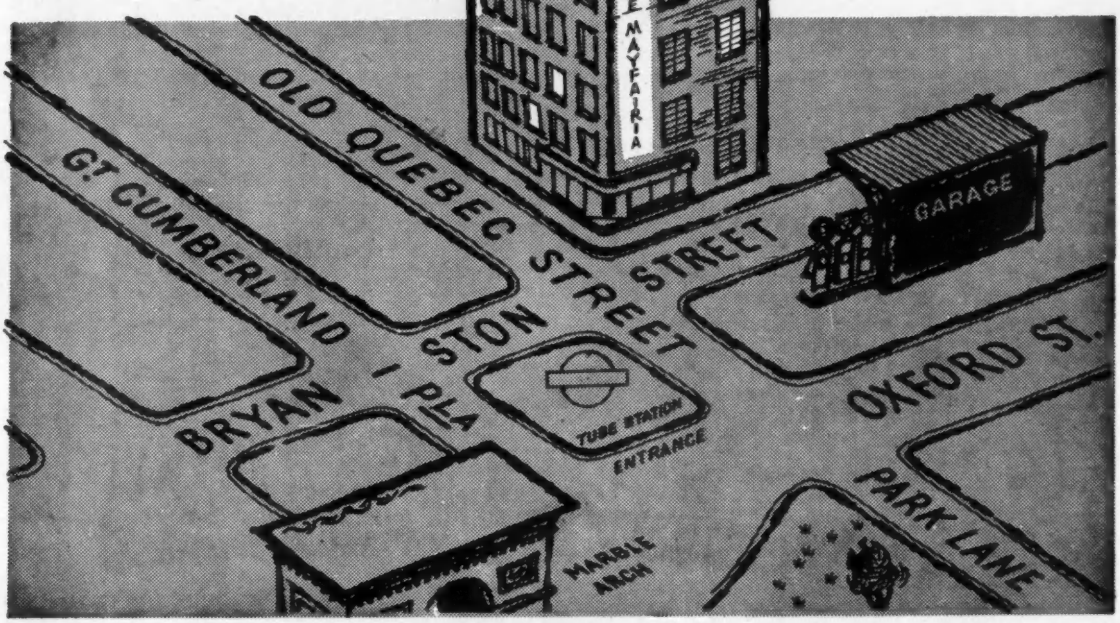

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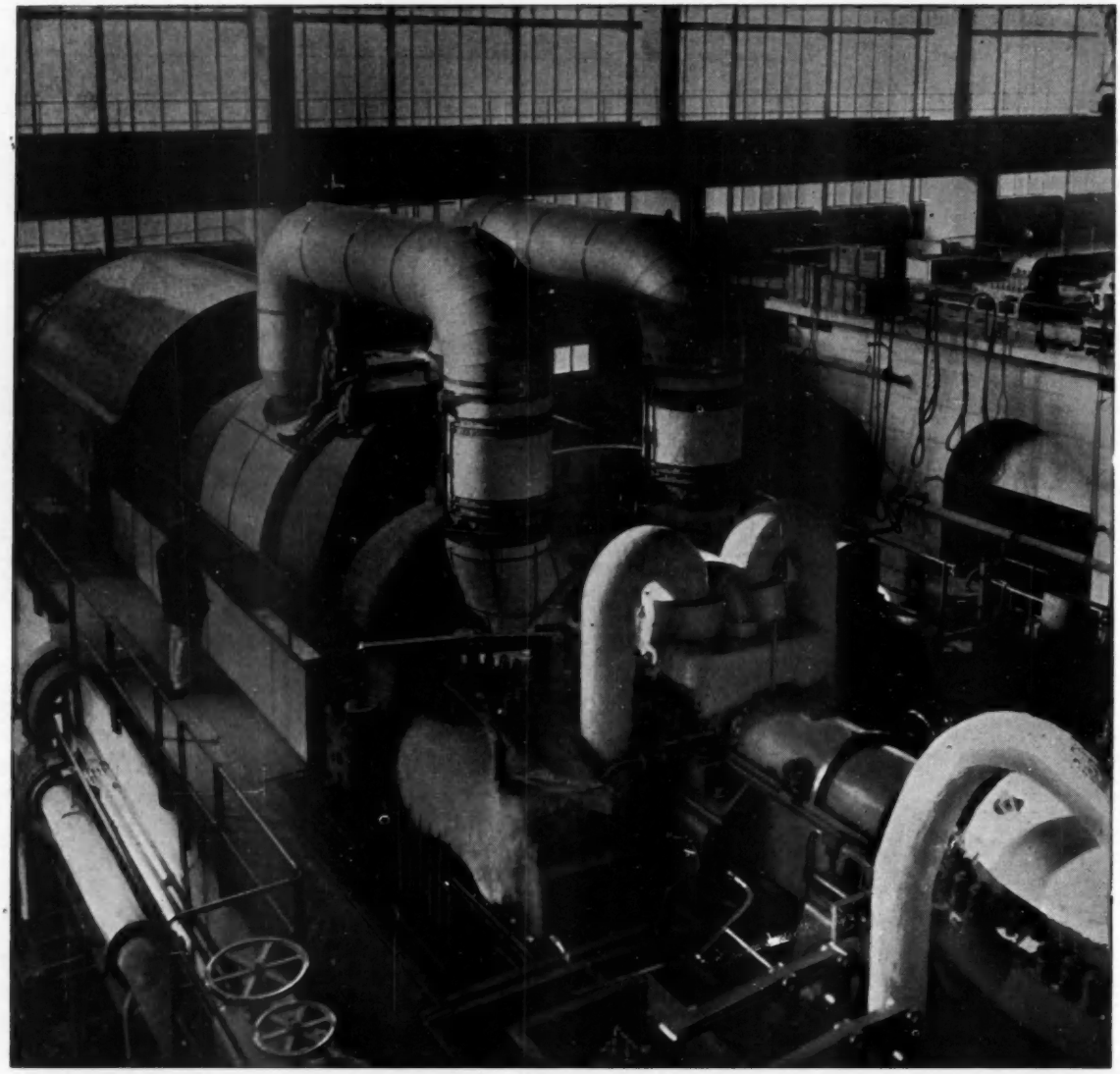

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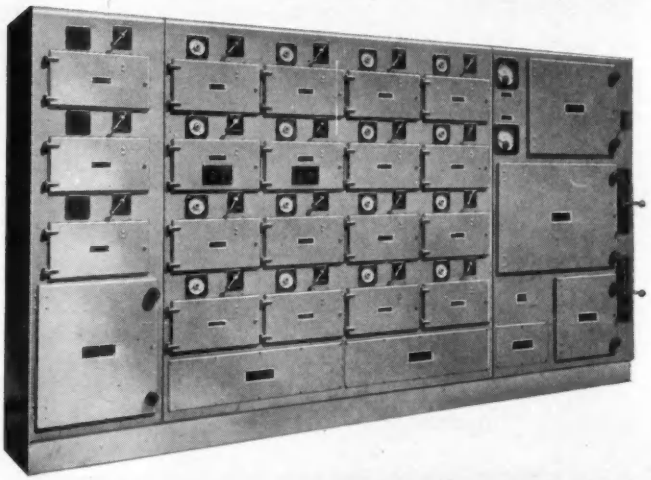
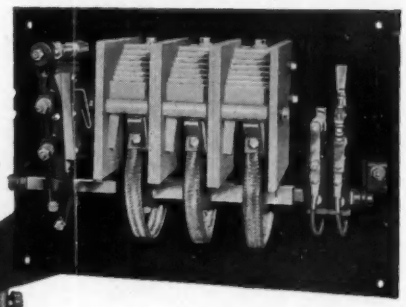
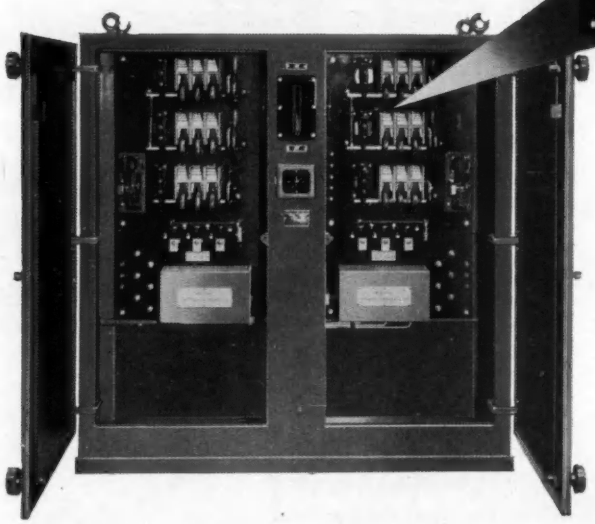


On the left is illustrated a typical Multi-Motor Switchboard with busbar-fed individually isolated starter cubicles



Twin 35 h.p. Star-Delta Cubicle with Central Isolator



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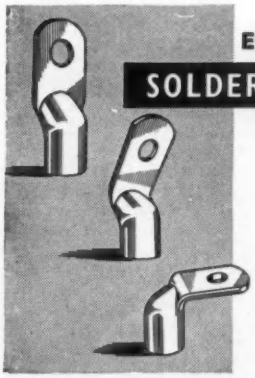

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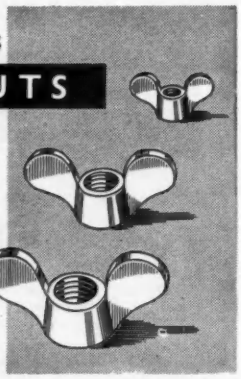

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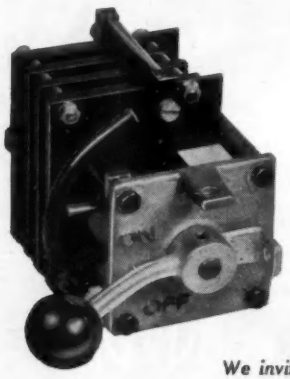

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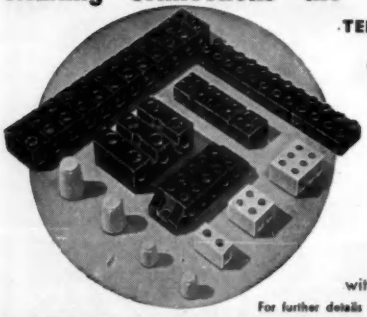

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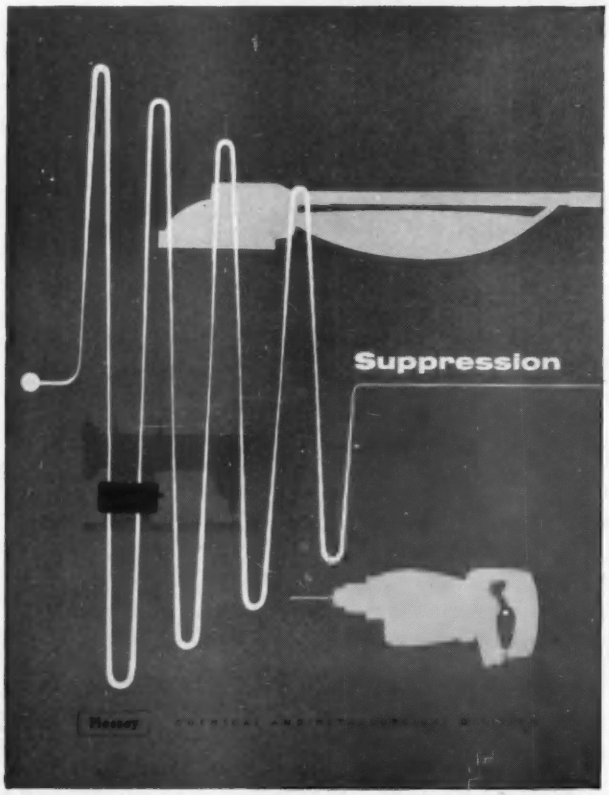
on the subject of suppression

This new Plessey publication is designed to assist all those currently concerned with the problems of suppression of all electrical equipment. The book provides Design Engineers with a standard reference to the complete range of suppressors produced by Plessey at Towcester, their individual suitabilities in application, their construction and their operational characteristics. Many illustrations and dimensional diagrams are included. Please ask for Plessey Publication No. 952.



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CHEMICAL AND METALLURGICAL DIVISION
THE PLESSEY COMPANY LIMITED
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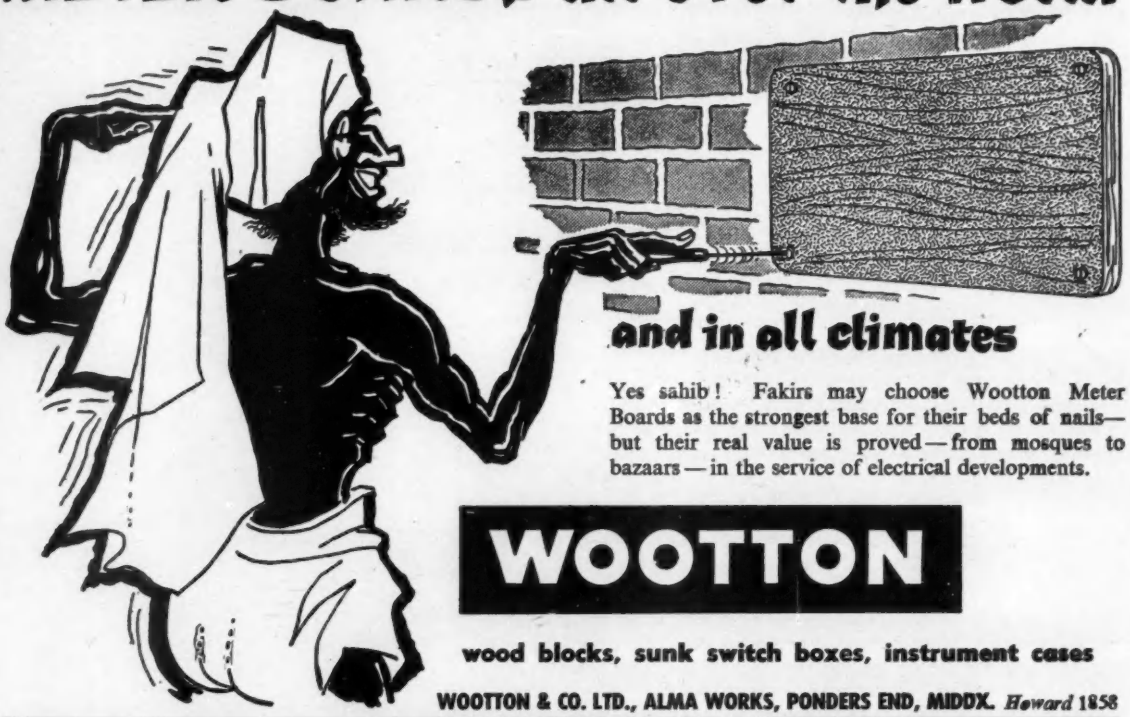


and in all climates

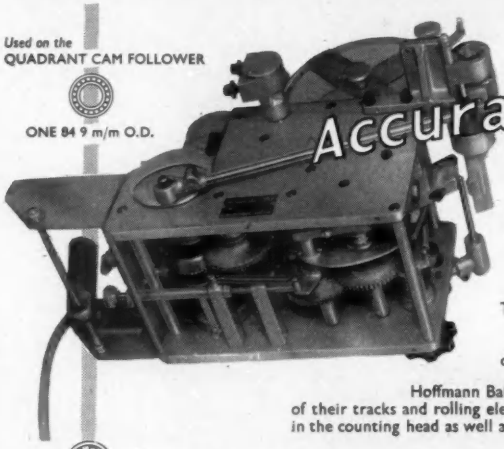
Yes sahib! Fakirs may choose Wootton Meter Boards as the strongest base for their beds of nails—but their real value is proved—from mosques to bazaars—in the service of electrical developments.

WOOTTON

wood blocks, sunk switch boxes, instrument cases

WOOTTON & CO. LTD., ALMA WORKS, PONDERS END, MIDDX. *Howard* 1858

Accurate counting



Used on the QUADRANT CAM FOLLOWER ONE 84 9 m/m O.D.

Vacuumatic Ltd., of Harwich, are producing a range of ingeniously designed mechanical counting machines doing their work in National Banks, Security Printers and Paper Mills throughout the world.

These machines are capable of counting 1,500 sheets of paper a minute, such rapidity and accuracy of motion demand bearings of the highest quality.

Hoffmann Ball Bearings on account of the fine finish of their tracks and rolling elements impart smooth sensitive motion in the counting head as well as on other positions on these machines.

A Vacuumatic Paper Counting Machine in operation

Used on the STRIKER GEAR ONE N463 ⅜" O.D.

You can *Count* on

Used on the WIPER PIN HOUSING TWO 86 13 m/m O.D.

Used on the PUSH ROD LINK ONE 4666 ½" O.D.

HOFFMANN

Used on the HEAD CARRIER FOUR 51 ¾" O.D.

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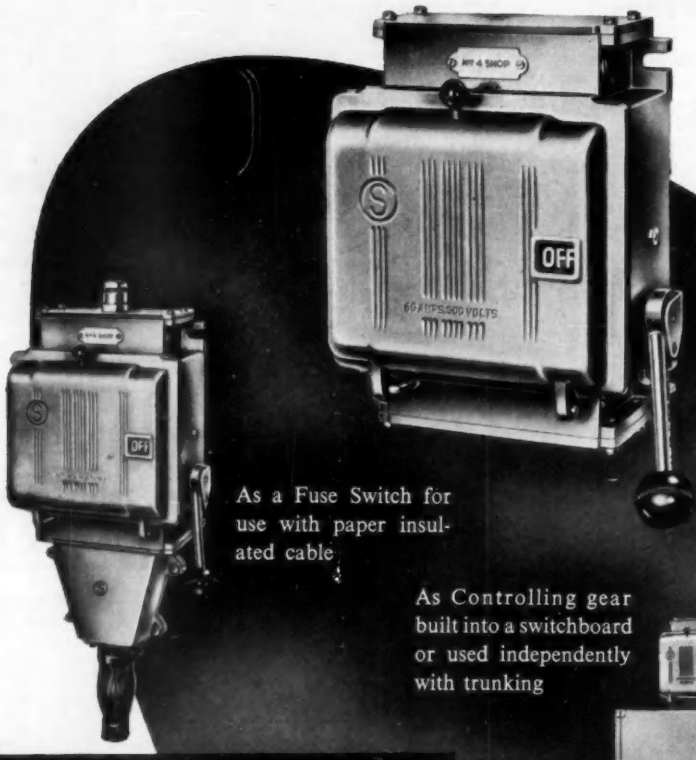
MINIATURE BALL BEARINGS

THE HOFFMANN MANUFACTURING CO., LTD. CHELMSFORD ESSEX

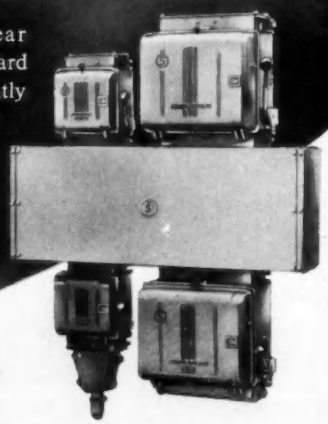
so **MANY** *applications . . .*



As an individual Fuse Switch or Isolator

As a Fuse Switch for use with paper insulated cable

As Controlling gear built into a switchboard or used independently with trunking



The "SANDACLAD"

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. . . where reliability is essential you find . . .

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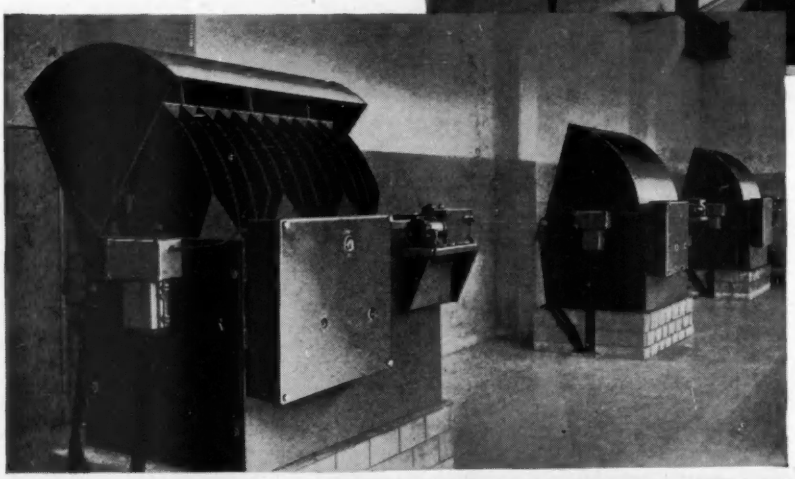
MOTOR CONTROL GEAR

The liquid starters illustrated were supplied to the Obras Sanitarias de la Nacion for their Caballito Pumping Station. They control 1320 H.P. motors which themselves drive Centrifugal pumps. There are similar installations in several other pumping stations.

The starters were installed by the Harland Engineering Co. Ltd., Alloa, who were the main contractors.



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EARLS COURT ELECTRICAL ENGINEERS A.S.E.E. EXHIBITION

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The **SWITCHGEAR** *with the* **WORLD-WIDE REPUTATION**

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SWITCHGEAR SPECIALISTS

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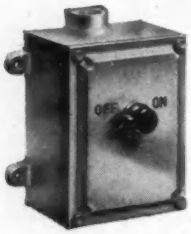
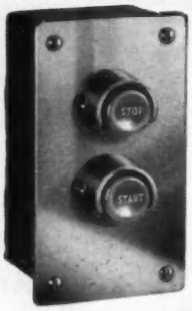


SPARKLESS UNITS FOR SAFETY



For operating theatres or situations in Hospitals and Nursing Homes where explosive mixtures, ether laden atmosphere etc., constitute a danger, "WALSALL" Sparkless Switches, Switched Socket Outlets and Push Button Stations ensure ABSOLUTE SAFETY in light and Power control.

WALSALL CONDUITS LIMITED
EXCELSIOR WORKS WEST BROMWICH

I gather Ransome & Marles have a substantial export trade?

Yes. Business overseas has been done for many years through agents and subsidiary companies. Among our biggest customers are many of the newly industrialised countries in Africa and the Far East—countries which are now equipping themselves with machinery at an enormous rate. We also export our bearings to the established industrial areas—to Europe and North America—where our products enjoy a long record of first-class service.

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We have indeed. Something like eighty agency offices throughout the world. We are concerned, mainly, with providing an unrivalled on-the-spot service for overseas industry. Firstly, we produce bearings that will stand up to arduous conditions of work in every climate. Secondly, local users are thoroughly informed about all the factors affecting the actual running of the bearings. Thirdly, the purchaser is safeguarded with after-sales service. These are our obligations to the foreign manufacturer. I think it is fair to say that we meet them very successfully, because we are constantly expanding our export business and shall continue to do so in the future.

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Electrical Review 7 February 1958

COMING ATTRACTION BY JACKSON

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THE JACKSON 'JOY' W

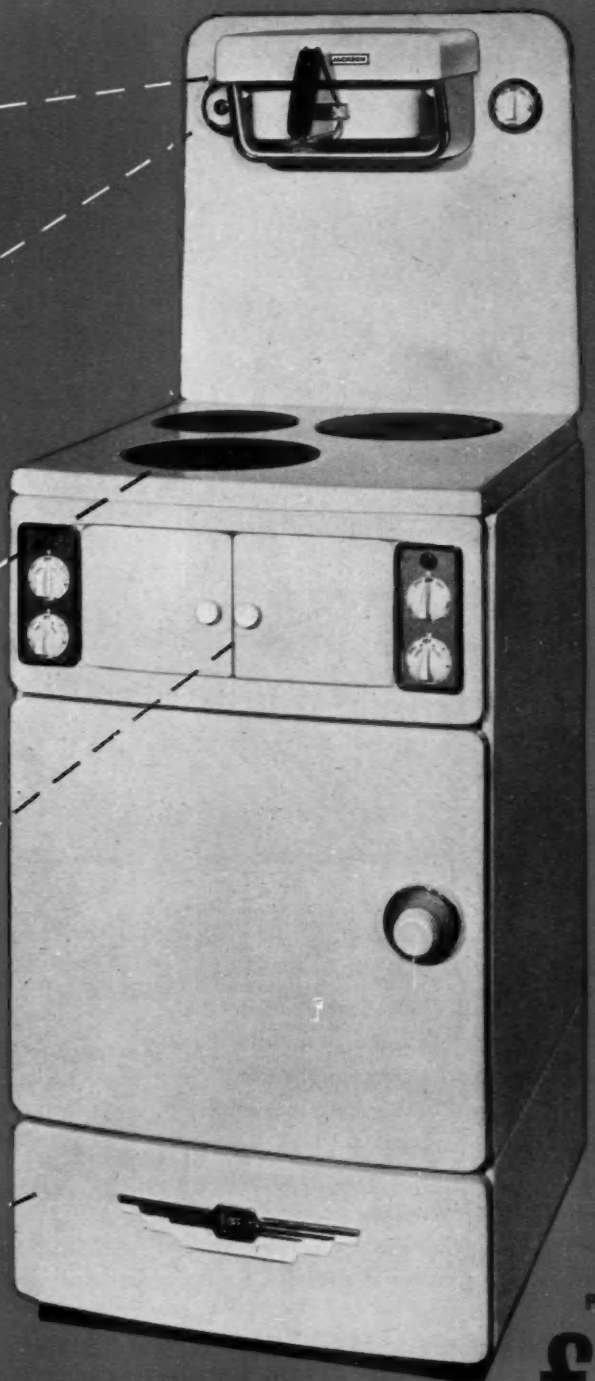
'SPATTER-FREE' EYE-LEVEL GRILL (10½" x 8")

'COOKALONE' AUTOMATIC TIME CONTROL

3 'SPEEDRING' PLATES with 6-heat switches

HOT CUPBOARD WITH DOORS

INDEPENDENTLY HEATED WARMING DRAWER



Cream or White with Gold and Chrome embellishments

PRICE

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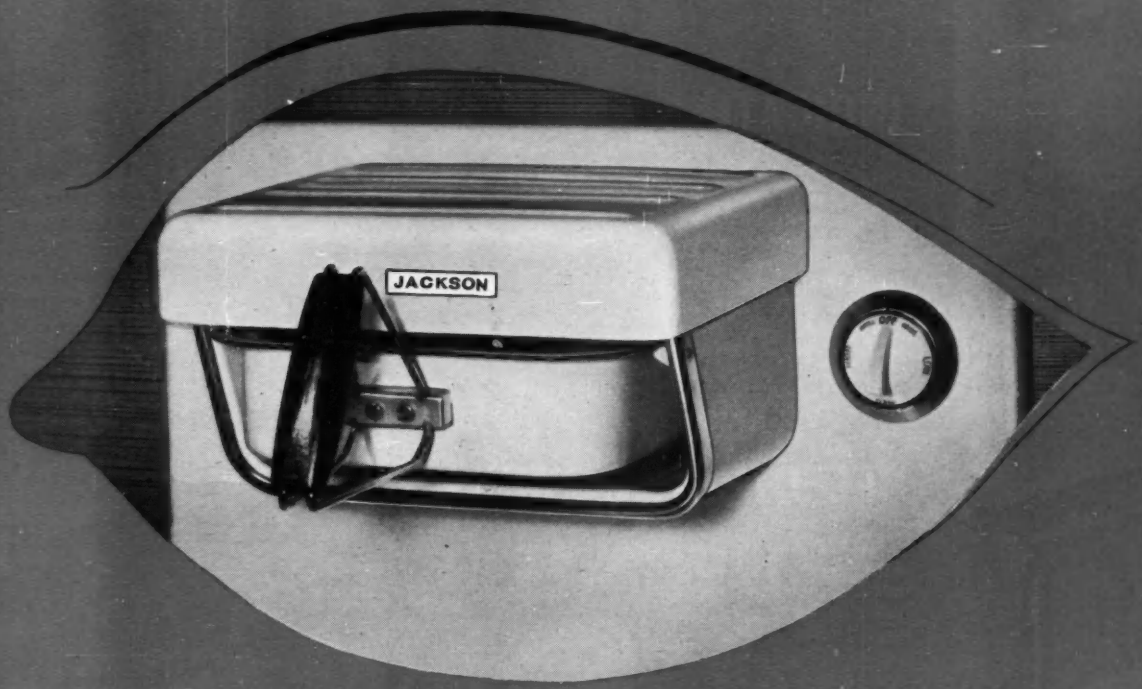
... and right on top!

WITH THE EYE LEVEL GRILL



In nearly 50 years of business, Jackson's have made many important contributions to Electric Cooking. Perfection in the oven has been achieved—then the 'Speedring' plate for the hob of the cooker. Now a further 'top-level' development—

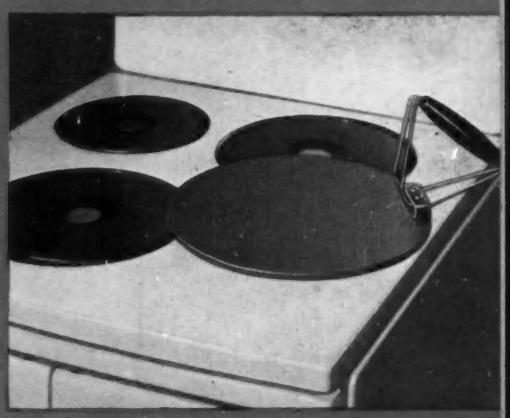
an independent SPATTER-FREE, enclosed eye-level grill

TOP-LEVEL COOKING TO PERFECTION

By placing the Grill at this convenient height, Jackson's can offer these important features.

- ★ ***Really fast and efficient grilling with independent control.***
- ★ ***An EXTRA fast boiling 'Speedring' plate with 6-heat switch control, just where it's wanted—in front of the Hob.***
- ★ ***An exclusive feature—Oven Roof Protector, using aluminium foil, FREE with every cooker.***

FREE—Girdle Plate with every cooker.



For satisfaction—
sell them

Jackson

THE JACKSON ELECTRIC STOVE Co. Ltd., Luton & London. Branches: Belfast, Birmingham, Cardiff, Glasgow, Leeds, Liverpool, Newcastle-on-Tyne

PUSHBUTTONS

Smartly engineered, in minimum size, ruggedly built, simple to mount and connect, these modern pushbutton units not only look better but will prove their worth in more reliable, more trouble-free operation—longer.

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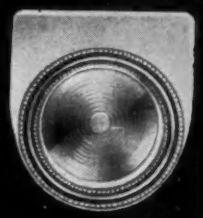
Designed in two styles—the exclusive Pres Test with its built-in testing feature and the standard—both in resistor and transformer types, both compactly designed to match the space-saving feature of the entire line.

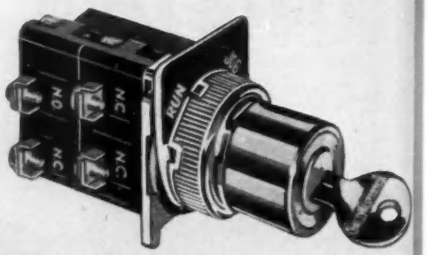


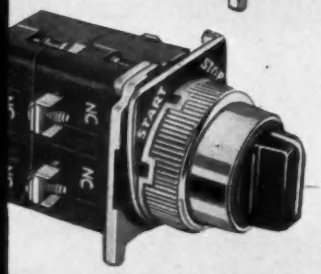
SELECTOR SWITCHES

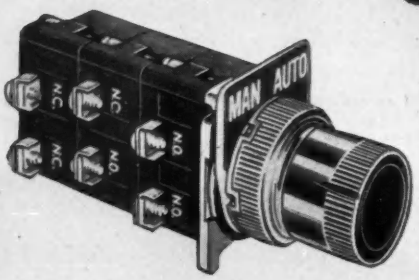
Using the same ingenious and compact contact block as the pushbutton units—include knob and key types. The multiplicity of circuit combinations obtainable is almost unlimited.

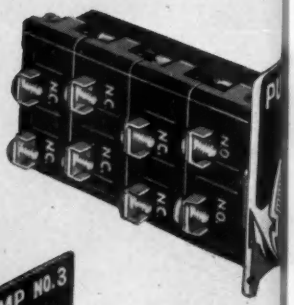
Full particulars from Publicity Department, Bedford

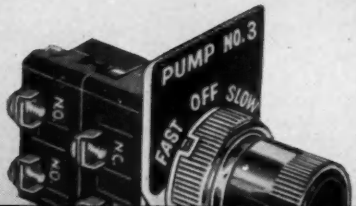
an infinite number of combinations











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heavy duty oil-tight control units

IGRANIC ELECTRIC CO LTD

head office and works Bedford

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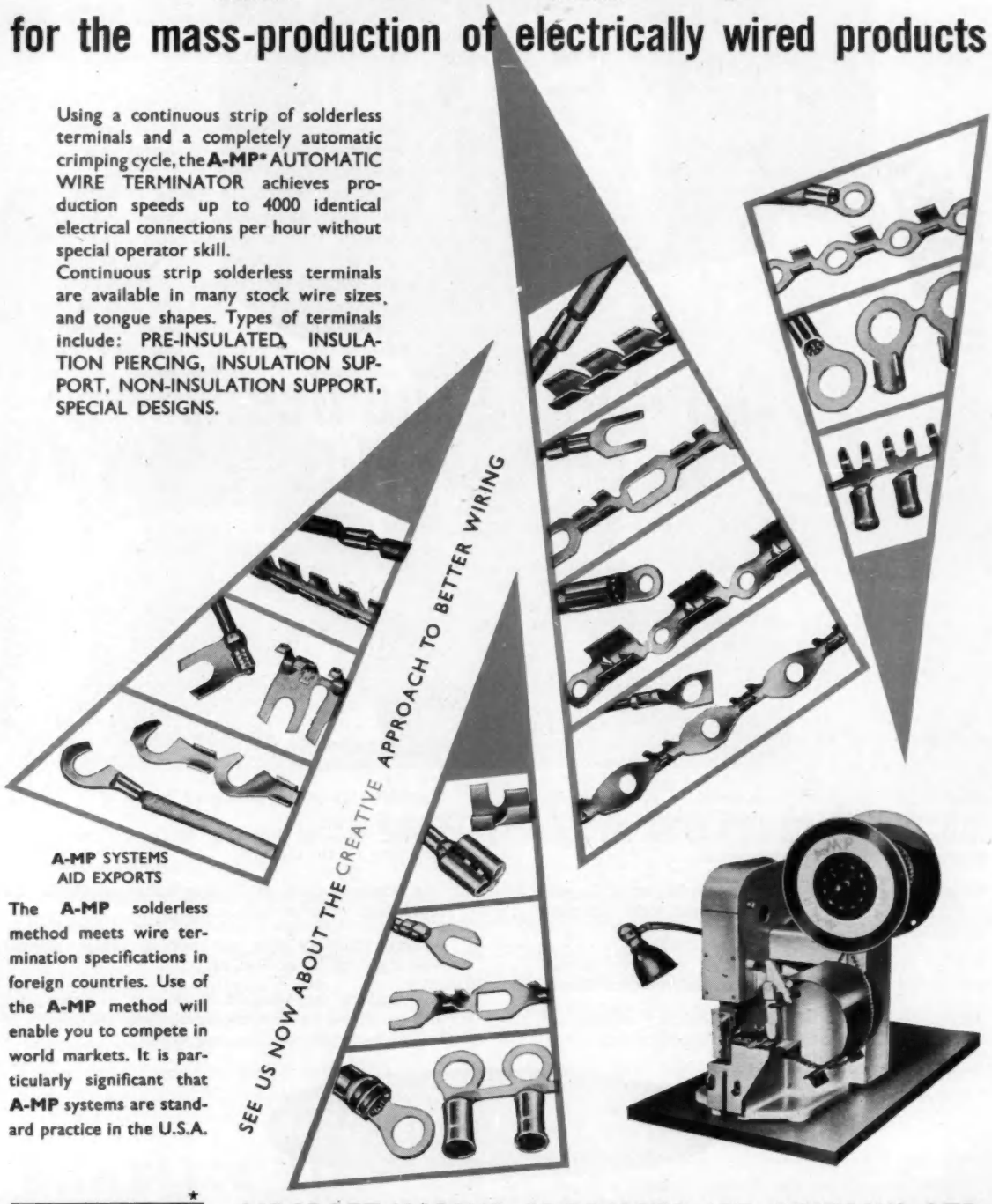
for the mass-production of electrically wired products

Using a continuous strip of solderless terminals and a completely automatic crimping cycle, the **A-MP*** AUTOMATIC WIRE TERMINATOR achieves production speeds up to 4000 identical electrical connections per hour without special operator skill.

Continuous strip solderless terminals are available in many stock wire sizes and tongue shapes. Types of terminals include: PRE-INSULATED, INSULATION PIERCING, INSULATION SUPPORT, NON-INSULATION SUPPORT, SPECIAL DESIGNS.



A-MP SYSTEMS AID EXPORTS

The **A-MP** solderless method meets wire termination specifications in foreign countries. Use of the **A-MP** method will enable you to compete in world markets. It is particularly significant that **A-MP** systems are standard practice in the U.S.A.

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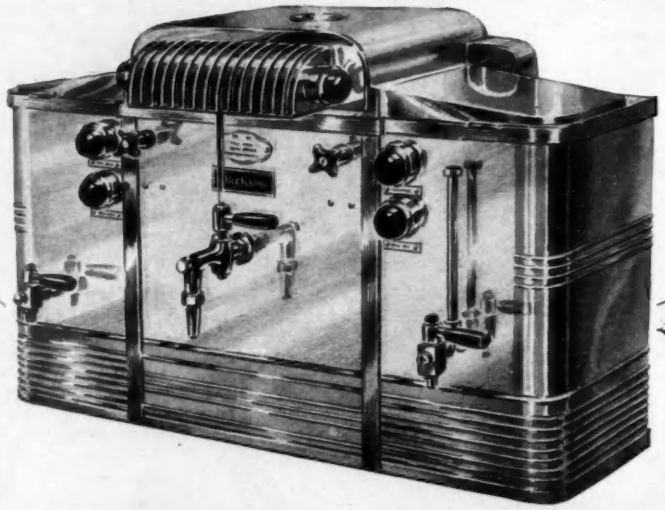

Combining the best of both worlds

A customer whose name is a household word on both sides of the Atlantic came to us and said, "You know, there are some things you do better than the Americans and some things they do better than you. We want you to combine the best of both worlds."
So, our designers and technicians got to work and produced the

CEW

The CEW is a self contained, fully automatic electrically heated unit which delivers positively boiling water, makes coffee, heats milk and stores them at the correct temperatures.

Incorporates a central independent boiler, a 12 pint coffee urn and 12 pint milk heater, both stainless steel lined.

Coffee making is by means of a fabric infuser positioned in a stainless steel frame of novel design.

Jacomatic system ensures automatic control of electricity.

Complete system of indicating lights.

Boiling water is delivered within 10 minutes of switching on the current.

One hundred pints of boiling water available for rapid draw off after fully heating.

Average delivery rate per minute under normal working conditions is six pints.

We shall be very pleased to receive your enquiry and to advise on matters concerning the supply of boiling water for catering purposes.

Jackson Boilers

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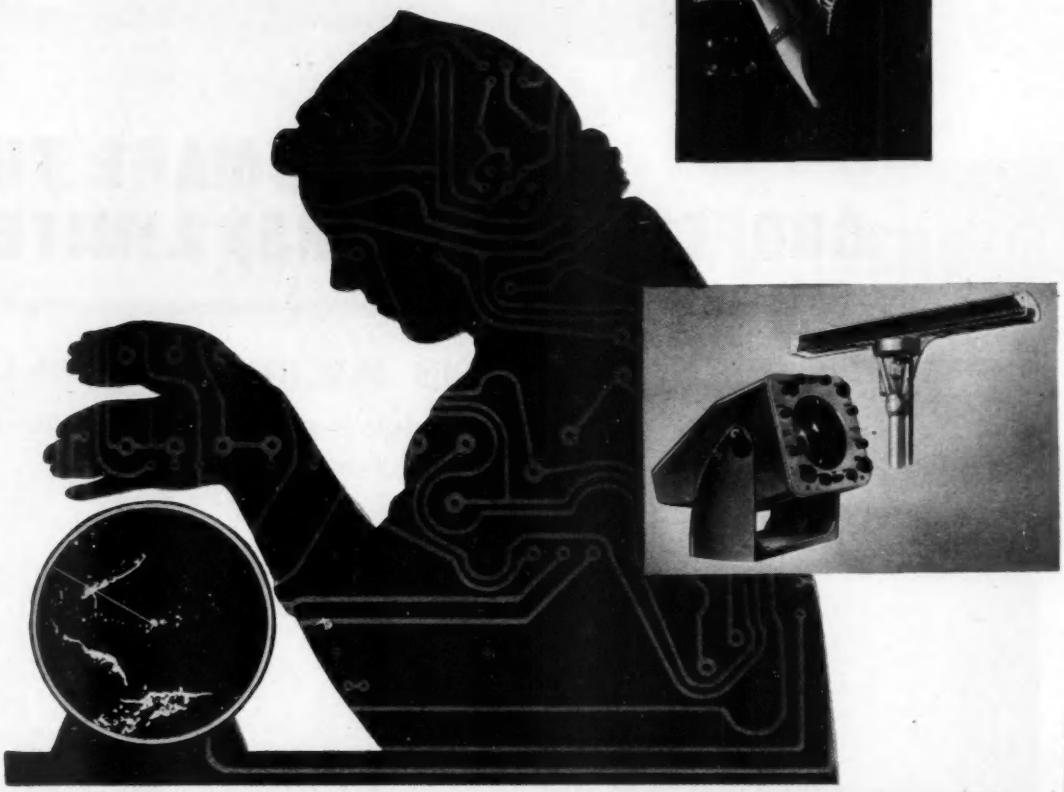

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TRADE MARK

The problem of fitting high performance Radar into a compact and lightweight unit suitable for almost any ship has been successfully solved in the Kelvin Hughes type 14 Marine Radar. An important contribution is the extensive use in the Power and Display units of printed circuits produced from BAKELITE Copper-Clad Laminated Materials.

Today printed circuits on BAKELITE Copper-Clad Laminated Materials, either rigid or flexible, are finding new applications throughout the Radio and Electronics industries. They allow more freedom and precision to the designer, reduce production time and costs for the manufacturer, and give the customer a lighter, more compact and reliable instrument.

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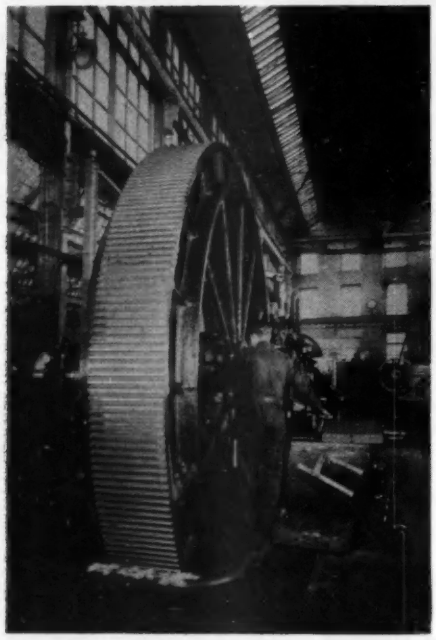


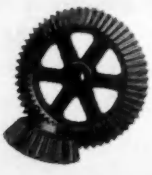
CROFTS MACHINE CUT GEARS

for every duty—gears up to 180″ diameter 32″ face width and 6″ CP

Publication 5519

- our own high grade castings and precision gear cutting: one responsibility, one high quality
- special fabricated gears also built to the highest standards
- full stock range
  spurs up to 34 hp
  Bevels up to 44 hp
  Mitres up to 70 hp
  larger sizes at shortest notice

Double helicals up to 180″ diam. 32″ face, 6″ CP



Bevels and Mitres up to 72″ diam. 14″ face, 4″ CP

Spiral Bevels up to 60″ diam.

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for ball, rod, and tube mills
Gears up to 180″ diameter 30″ face width and 5″ CP

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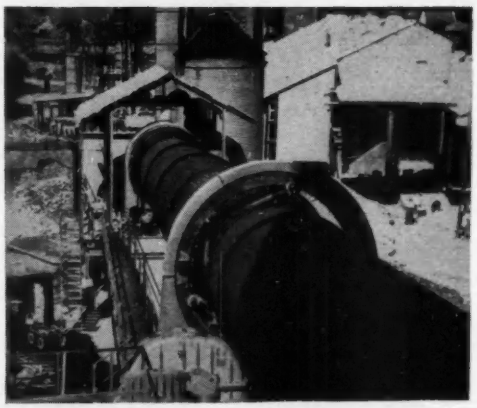
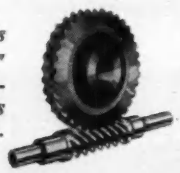
precision modern gear drives for the toughest duties

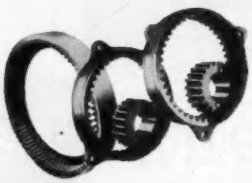


Crofts Kiln drive at a South African Cement Works

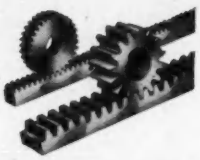
Worms and Wheels
Worms up to 12″ diam. and 3″ normal pitch. Wheels up to 102″ diam. 3″ normal pitch



Internals
up to 96″ out. diam. 6″ face, 1½ DP smaller diams. down to 20 DP



Racks and Pinions
up to 5″ pitch and any length



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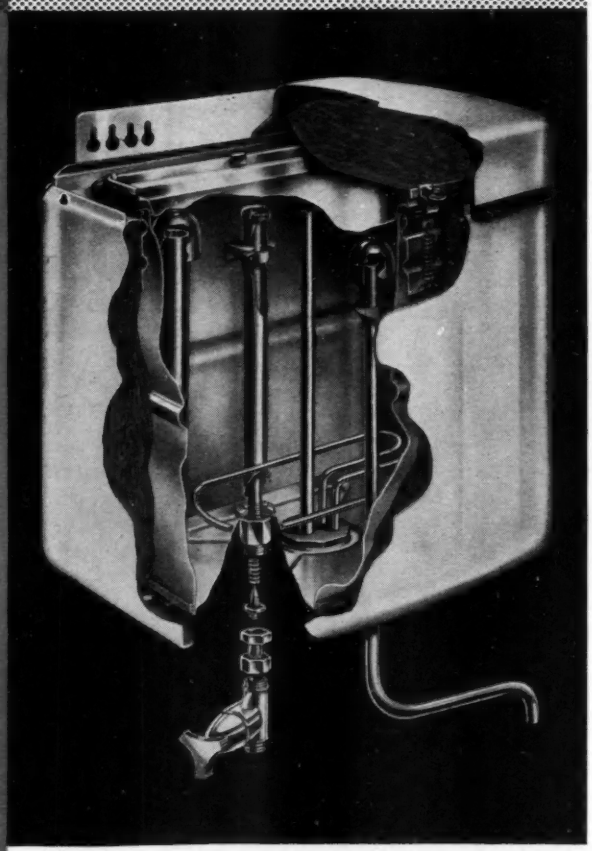
1ST

the NEW Creda Crusader with

Automatic Restrictor Valve!



right-first-time installations

with the new Creda Crusader! thanks to Creda's exclusive Automatic Restrictor . . . the valve that gives the right setting infallibly—without any adjustment!

District and time variations in water supply pressures are all one to the new Crusader. No longer need an adjustable restrictor be set or selected when the heater is installed. The new Crusader automatic flow restrictor needs no setting or adjustment; it controls the flow rate to ensure perfect operation at pressures from 10 to 100 lbs per square inch. It cannot of course cut off the water flow completely. When pressures are below 7 lb per square inch—if the heater is fed from a low level storage tank—the plunger need only be removed from the body of the restrictor to obtain satisfactory operation. With this new Creda refinement the Crusader becomes the easiest-to-install water heater on the market

two more Creda Crusader improvements

SPRING CLIPS now retain the lid of the water container. Easier removal—positive fastening

DE-FURRING without breaking any water joints

stock the improved

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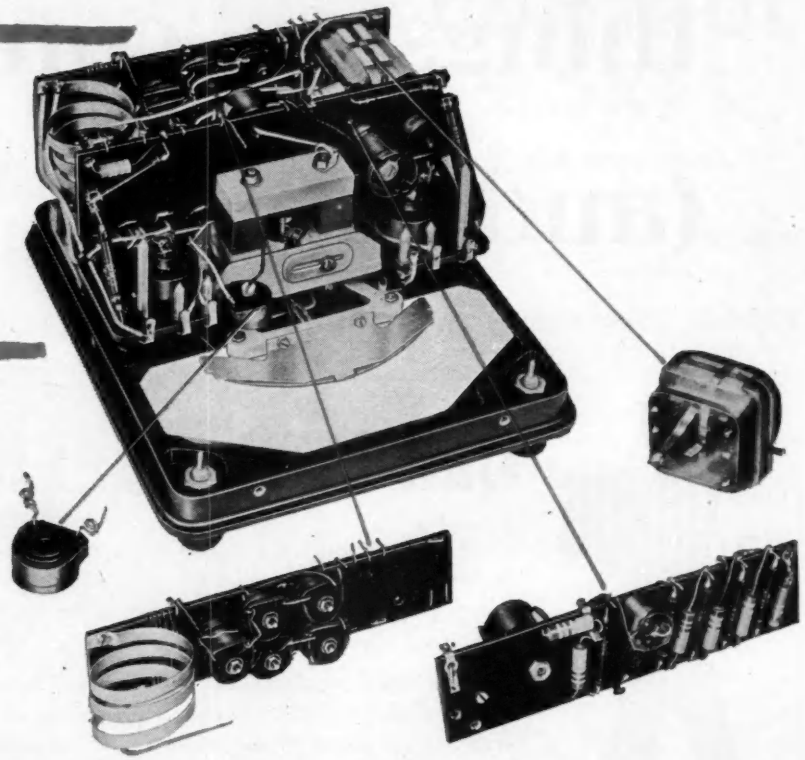

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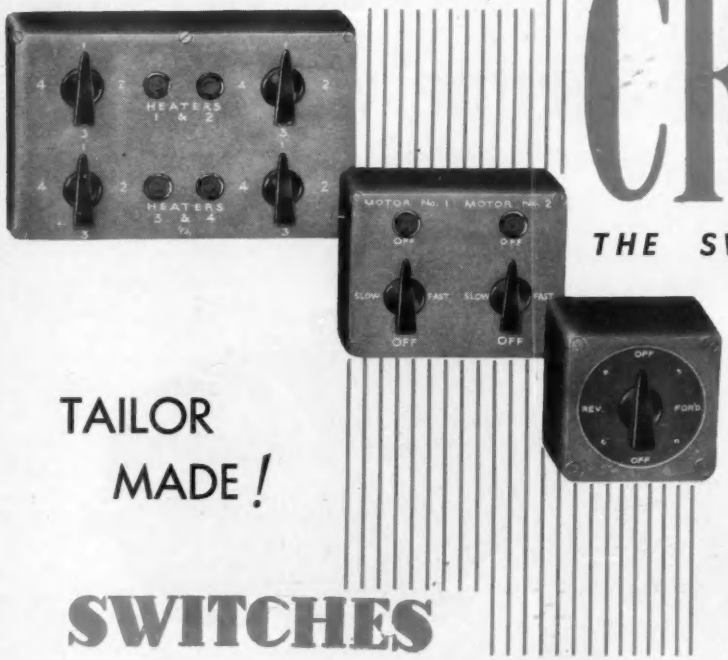

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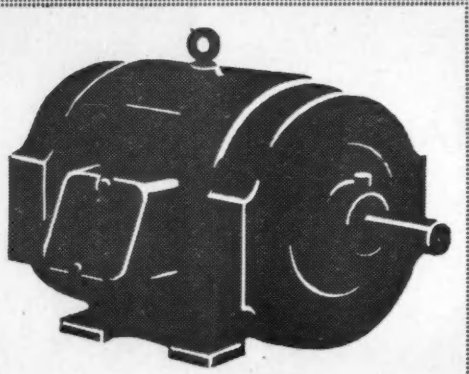

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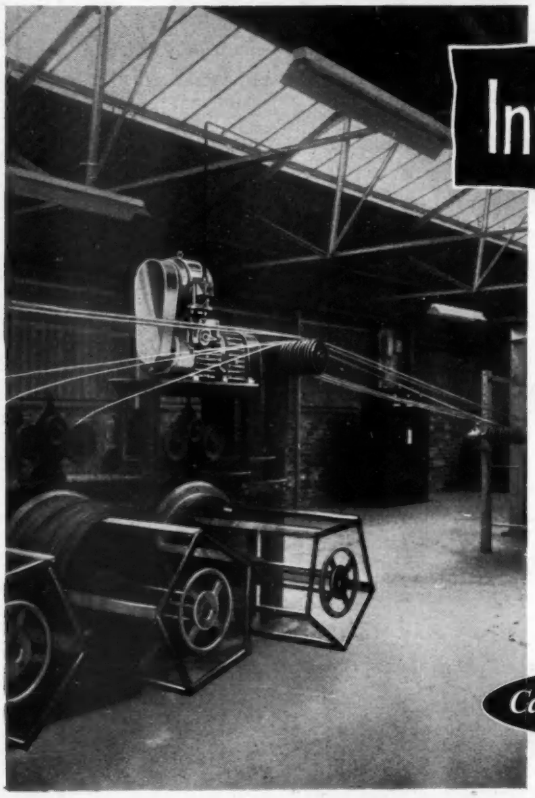

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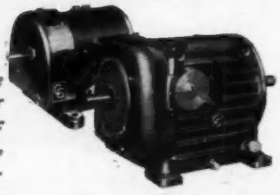

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7 FEBRUARY 1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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VOLUME 162 NUMBER 6 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home £4 15s 0d; Overseas £5 15s 0d: U.S.A. and Canada $16.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

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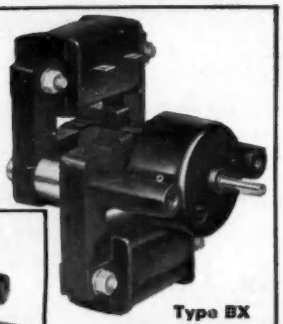

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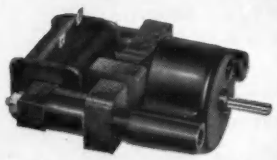

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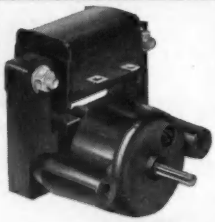

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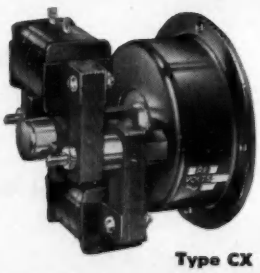

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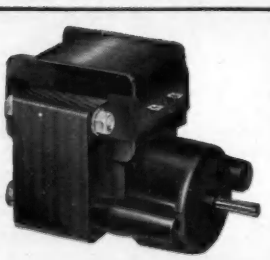

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ELECTRICAL REVIEW

7 February 1958 Vol. 162 No. 6 Established 1872

Hydro-Electric Prospects

IN taking advantage of a natural head of water for generating electricity it is commonly said that we spend energy income, but that in burning fossil fuels we are living on energy capital. For that reason the fullest use of self-renewing moisture precipitation has been a prime aim where geophysical conditions make this course economical. Limits to the development of hydro-electric schemes have generally been remoteness from load centres and the heavy initial expenditure on civil engineering works, including reservoirs and dams, and on transmission systems, all designed for ultimate output capacities. In contrast, plant in localised and less expensive thermal stations can be installed piecemeal as the electrical demand grows.

Nevertheless the overall amount of water power put into service has steadily increased, but another disturbing factor has come to the fore as regards Western Europe. Only a few years ago it was estimated that within the next twenty years or so all water power capable of commercial exploitation would have been fully developed. Before then some countries now largely dependent on this form of energy were believed to be perilously near the end of their indigenous resources in the face of a probable doubling of electrical demand. That view, with its implied lack of faith in the possibilities of technological progress, now appears to have been unduly pessimistic.

These possibilities, now becoming actualities, can be glimpsed in a new document issued by the United Nations entitled " Bibliographical Index of Works Published on Hydro-electric Plant Construction " (Vol. 1, obtainable at 4s 6d through national agencies). Brief notes reveal the remarkable effects of modern practice in materially cheapening and speeding up civil engineering construction and in greatly improving the efficiencies of both Kaplan and Francis turbines running at higher speeds over a wider range of hydraulic head. Fuller advantage can be taken of these advances by the concurrent progress in transmission voltages. The result is that many schemes once regarded as economically impracticable can now be reconsidered in a much more favourable light. Outputs of water-power stations also are being increased through interconnection, thus smoothing out the effects of differences in climate and gaining the advantages of operating in parallel with steam stations.

With the coming of nuclear fission, the value of quick starting hydro-plants with smaller and cheaper reservoirs (such as those in the north of Scotland), which would avoid putting peak loads on atomic power stations, should be greater. Looking ahead, perhaps many years hence, water may become even more important in the production of

electricity than for directly driving generators or for cooling steam condensers. This will be when it becomes the main source of heavy hydrogen in controlled nuclear fusion (thermonuclear reactions), the first major step towards which, at Harwell, was described in our last issue.

COMMODITY PRICES AND CONTRACTS

Reference was made in last week's leading article to the possible adverse effects upon our export trade of the decline in prices of raw materials. Although cheaper materials mean lower production costs, if the producing countries, our customers, have to supply these materials at unremunerative prices their purchasing power is diminished.

So far as the electrical industry is concerned, copper has been a prominent example of what is involved. In the past two years the price of copper has fallen from about £400 to £170 a ton. Apart from the fact that this has badly hit manufacturers who have had to acquire large stocks on a rapidly falling market, it has severely diminished the revenue of the producers and the Governments of such countries as Rhodesia. One consequence of this is manifest in the decision of the Government of the Central African Federation to postpone action upon the scheme for the electrification of the Rhodesia Railways at a cost of £23·5 million which had been recommended by its consultants. This is a scheme for which British electrical manufacturers could fairly hope to secure large contracts.

TRAIN COLLISION

Following so soon after the major train disaster under fog conditions at Lewisham just before Christmas, it is sad to have to refer to last week's smaller, yet still very serious, accident at Dagenham on the London, Tilbury and Southend system of the Eastern Region of British Railways. In this case a moving train ran into a stationary train on the same line. We have a deep concern electrically because the line here is equipped with automatic train control whereby a warning of danger should normally be given to the driver in his cab when he approaches a "distant" signal. The Eastern Region A.T.C. system is based upon the electro-magnetic principle of operation as distinct from the physical contact principle. We must not comment upon the possible causes of the disaster before the results of a public inquiry into it are made known, but in view of the circumstances we are very anxious to know what went wrong.

EDUCATING THE ARCHITECT

Architects exercise a considerable influence in the matter of electrical installations in new buildings of all kinds and consequently it is meet and right that the electrical industry should cultivate their interest and endeavour to instruct them in electrical matters. First, of course, it is necessary to persuade architects to include the electrical installation in their designs and not merely allow the installation to be added when the structural work is finished. Secondly, they must be encouraged to provide for adequate electrical installations and, thirdly, to ensure that the best materials and equipment are used in so far as they have any say in this.

The British Electrical Development Association is doing much to assist architects in this side of their work. For some time it has had in architectural journals a series of electrical data sheets dealing with various kinds of electrical installations. These have now been gathered together in a folder and thumb-indexed for easy reference. There are sheets covering electric cooking, lighting, refrigeration, space heating, water heating and kitchen planning, among others. All of them are of a practical character and should prove of great value to architects. We shall be pleased to obtain copies for readers who are interested.

PURCHASE TAX ANOMALIES

Many anomalies are apparently embedded permanently in the purchase tax schedules and the publication by the Commissioners of Customs and Excise of a new "Notice No. 78" provides an opportunity of once again drawing attention to them. The passing of the Clean Air Act, 1956, into law has stressed the absurdity of exempting solid fuel and oil-operated heating and water heating appliances from the tax while applying it to electrical (and gas) appliances. Coal does not conform with the requirements of the Act and oil (apart from its fumes) is an import which, as was shown a year or so ago, is subject to interruption when trouble arises near its source.

Very shortly, no doubt, the Electrical Development Association will be making its regular pre-Budget representations to the Chancellor of the Exchequer. If it is too much to expect the Chancellor to forgo revenue at the present time, we think that there is scope for the re-arrangement of the schedules to give electrical appliances some measure of fair play while still maintaining the total revenue from purchase tax.

Last week the new Chancellor, in the course of a reply to a Parliamentary question on quite another point, said that the review of "alleged" purchase tax anomalies which had been initiated by his predecessor was proceeding. Here is one matter which should come under scrutiny.

AUTOMATIC BOILER CONTROL

In his article on "Automatic Boiler Control," which appears in this issue, Mr. J. W. Malbon has shown, very authoritatively we think, what great advantages lie in automatic control by way of regulating the input of boilers by adjustment of the rate of combustion according to the changes of load on the electricity station, and therefore on the boiler. Mr. Malbon reviews a number of different systems of control, but they all point to the same thing—regulation of input which must have in the long run favourable economic results.

This maintenance of balance between input and output, although the primary consideration in the adoption of automatic boiler control, also has other very favourable influences. One is in connection with the combustion of low grade fuels which, but for modern methods of combustion and control, would have been impossible.

AUTOMATIC BOILER CONTROL

Its Advantages and Disadvantages

By J. W. MALBON

DURING recent years, much thought has been given to the improvement of the efficiency of steam raising plant in view of the continually rising cost of fuel. Improved heat insulation, more efficient design of boilers and other improvements have been made. These may be termed " invariable " once a boiler has been completed. Combustion is the most important variable with which we must deal. In power stations and industrial plants, equipment is designed for specific steam conditions. The steam raising plant is also designed to work most efficiently when giving steam at a temperature and pressure to suit the rest of the plant. The question now arises as to the best all-round method of accomplishing this ideal.

A load change will make a change in the steam conditions and in the water level in the boilers, but the most important thing is not the amount of change of load but the *rate* of change of load. Correction must therefore be made at the same time of change and at the same rate of change. This is very difficult with a constantly varying load. Under manual control of auxiliaries " overshoot " is likely to occur in both directions. A considerable time lag is also present as attendants must get to the various dampers, feeders, etc., after observing the alteration of load. When remote control was introduced together with improved instrumentation, this time lag was greatly reduced.

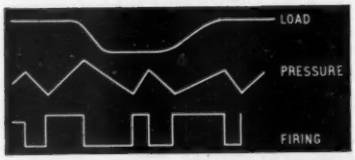


Fig. 1.—Typical results obtained from " on-off " control (see Fig. 2)

One method of stabilising the pressure and temperature is by using a number of boilers, such as the Lancashire type, which have a large thermal capacity. When the load drops, the rate of feed may be increased in order to keep the pressure down. Conversely, when load is increased, the water level is allowed to drop within limits in an attempt to maintain constant steam pressure. This method of stabilising steam pressure is uneconomical for the following reasons. The economiser is subjected to arduous working conditions during maximum firing periods immediately after rise of load, as the reduction in the flow of water results in possible overheating with danger of fracture. When load and firing are reduced and flow is increased through the economiser, the feed water enters the boiler at a low temperature. These conditions could be improved by proper use of dampers. However, as dampers are usually some distance from the firing position, the usual procedure is to leave the dampers in a partly open position and work on water level as above.

As boiler sizes increased together with an increase in complexity, some method was required to speed up control. The first step was to incorporate remote manual control of auxiliaries. This called for increased instrumentation. These two factors were a great step forward, and led to the development of automatic control as we know it to-day. The first attempt at automatic control was probably by the main flue damper, which utilised the varying steam main pressure as load varied. Its main disadvantage lay in the need to carry a thick fire at all times in order to meet quick rises in load. This caused waste of fuel on low loads as insufficient air was available for combustion, resulting in smoky fires and loss of unburnt volatiles.

To obtain efficient operation, especially of large modern boilers, quick regulating action is necessary. This action must quickly and accurately adjust auxiliary plant to obtain the following results: correct water level within close limits; correct steam pressure; correct steam temperature; accurate matching of air to fuel to obtain maximum all-round efficiency; constant furnace pressure, thus minimising the effects of infiltration of air. Matching of air to fuel can be controlled by comparing air and steam flows at correct steam pressure and temperature. The steam is thus a measure of heat output from the boiler and can be accurately compared by tests with the heat input of the fuel. Approximately 7·6 lb of air is required per 10,000 B.Th.U. This does not allow for excess air as may be required on any specific installation, which is determined by site tests.

Fig. 1 shows results obtained on a boiler using remote manual control. Variations can be seen in pressure, temperature and feed flow, which are no doubt due to the time lag in correction, together with " overshoot " or " under correction." The corrections are made from information given by the instruments. As the pressure must remain constant, continuous observation of the pressure gauge is necessary. From the trend of the reading on the steam-flow meter, a certain amount of anticipated correction can be made. This is, however, purely a matter of guesswork, resulting most likely in overshoot or under-correction. To obtain stability, continuous sensing of direction, magnitude and rate of change is necessary, with instant correction at the same rate and magnitude. This can be obtained only by fully automatic control of air, fuel and water.

Whilst control systems vary in detail, the common purpose is usually the same in each—to match the output of a boiler with the input with correct combustion in the furnace. The system with the lowest initial cost is the " on-off system " which is usually applied to small boilers with stoker, oil or gas firing (Fig. 2). Fuel and air are turned " on " to meet a rise in load and " off " when the demand has been met. The measuring element is con-

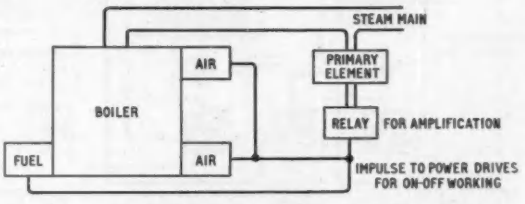
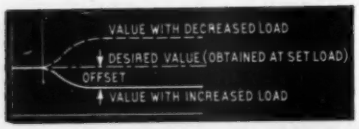


Fig. 2.—General arrangement of " on-off " firing system



Left: Fig. 3.—Offset from desired value with change of load with positioning control using proportional method only

Right: Fig. 4.—Result of including integral action in positioning control system

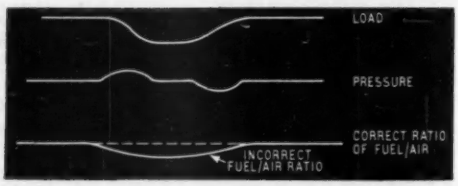


Fig. 5.—Relation of load, steam pressure and fuel-air ratio under positioning control

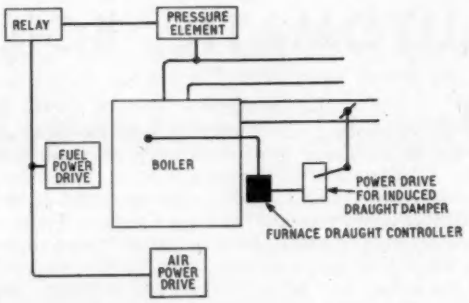


Fig. 6.—Typical layout of positioning control system

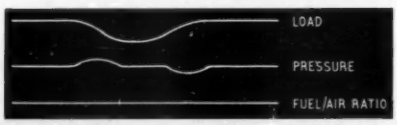


Fig. 7.—Relationship of main factors under metering control

nected to a tapping in the steam main. This element sends out a signal, usually electrical, to a relay for amplification. From the relay the amplified signal is passed to the controls for switching the fuel on, together with the combustion air. This system although usually electrical can be pneumatic or hydraulic. As can be expected, the steam pressure varies considerably between pre-set levels, due to the "on-off" firing. During the "off" period the natural draught tends to cool the furnace. For this reason the boiler outlet damper is often coupled to the system, so that it closes during the "off" period. A slight improvement can also be made by arranging a minimum pre-set fuel and air rate during the "off" period in order to keep the fire "healthy."

An improvement on the "on-off" system of firing is the positioning control system, which is used extensively on small- to medium-sized boilers. The measuring element is connected to the steam main as in the previous system and it can give an impulse which is either proportional, proportional plus integral action, or proportional plus integral action plus derivative action. If the primary element is purely proportional the other additions can be included in some part of the system. With proportional control only, the impulse sent out is proportional to the deviation of the steam pressure from the desired value. With this method the steam pressure is correct at only one load.

Fig. 3 shows the "offset" with change of load. If integral action is included, the firing rate is set to bring the pressure back to the desired value as in Fig. 4. With derivative action

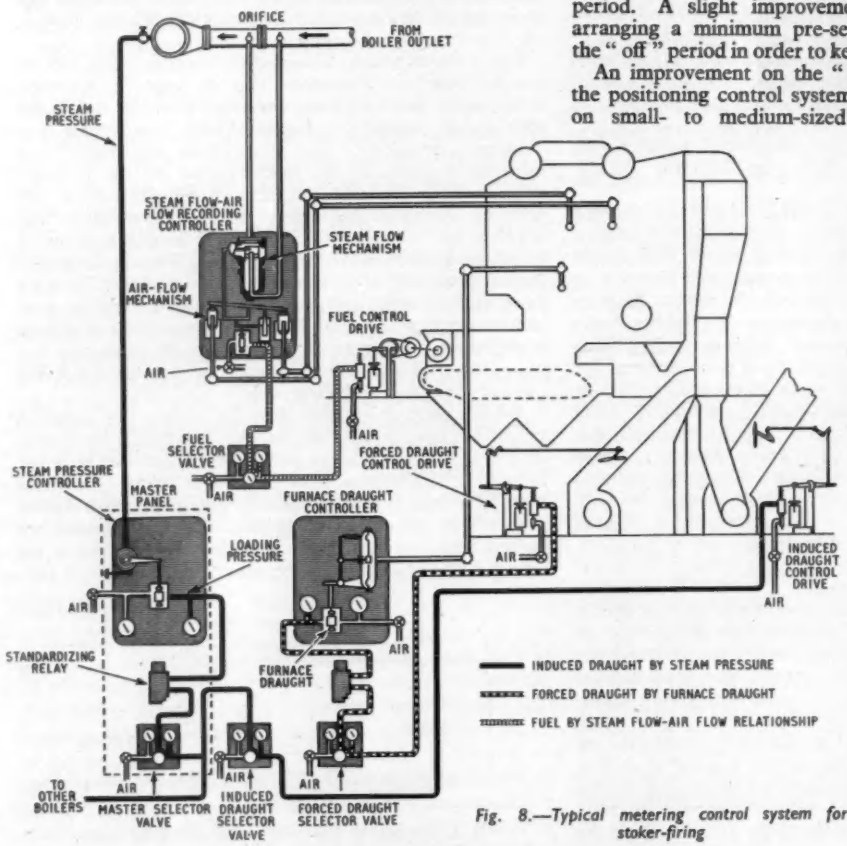


Fig. 8.—Typical metering control system for stoker-firing

the rate of change of firing is adjusted to the rate of change of load.

Whichever method is applied to the positioning control system, the impulse sent out positions the fuel and air controls according to the signal received. This method of firing can be set to maintain a good control of steam pressure. Its main disadvantages are in relating the fuel used in combustion to the combustion air. If the boiler passes become fouled, the air through the boiler will be reduced for any pre-set auxiliary position, resulting in poor combustion. This will tend to reduce pressure, which will call for more fuel and air, resulting in too "rich" a combination. The same results would be got through voltage variation at the fan motor or stoker motor terminals. No automatic adjustment is made for a change in the quality of the fuel. These faults can all cause poor efficiency although the last-named can usually be obviated by manual alterations to stoker input to the boiler, based on careful observations of instruments and furnace conditions.

The furnace draught is usually on a separate control system. This takes the measure of furnace suction from a tapping in the furnace chamber, and applies it to a relay, usually diaphragm operated. An impulse is then sent out from the relay to the power unit controlling the position of the induced draught fan damper or fan motor speed. Certain manufacturers reverse the above method, and control forced draught from the furnace. Figs. 5 and 6 show a typical result and a typical layout of positioning control.

A much more efficient method of automatic control is a further development of positioning control, i.e. the metering control system, which works primarily as the positioning control, with the addition of a correction to the signal received at the controlled auxiliary originated by a further "con-

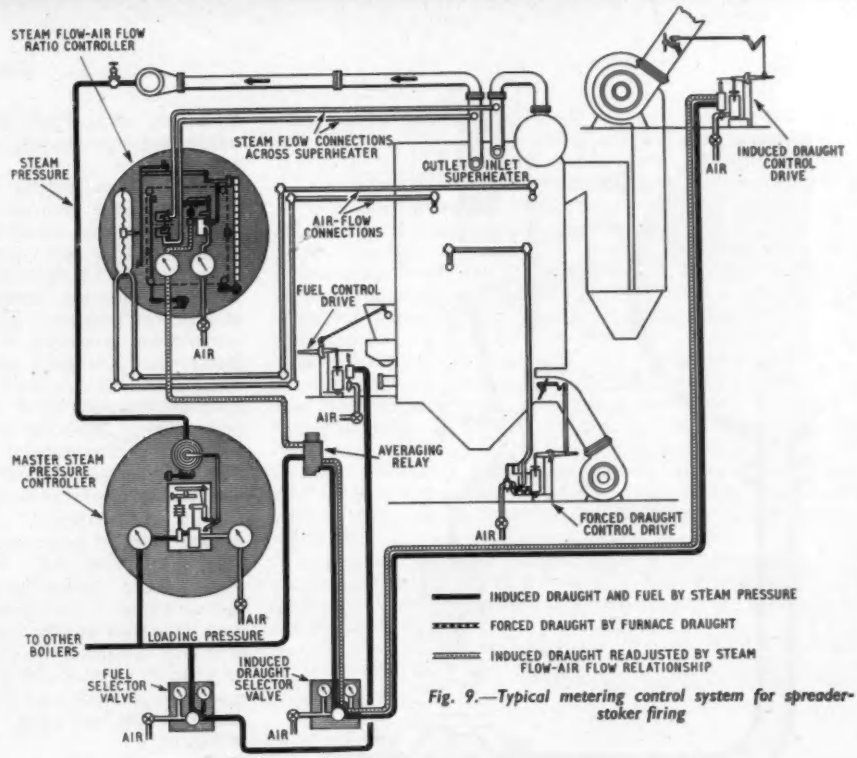


Fig. 9.—Typical metering control system for spreader-stoker firing

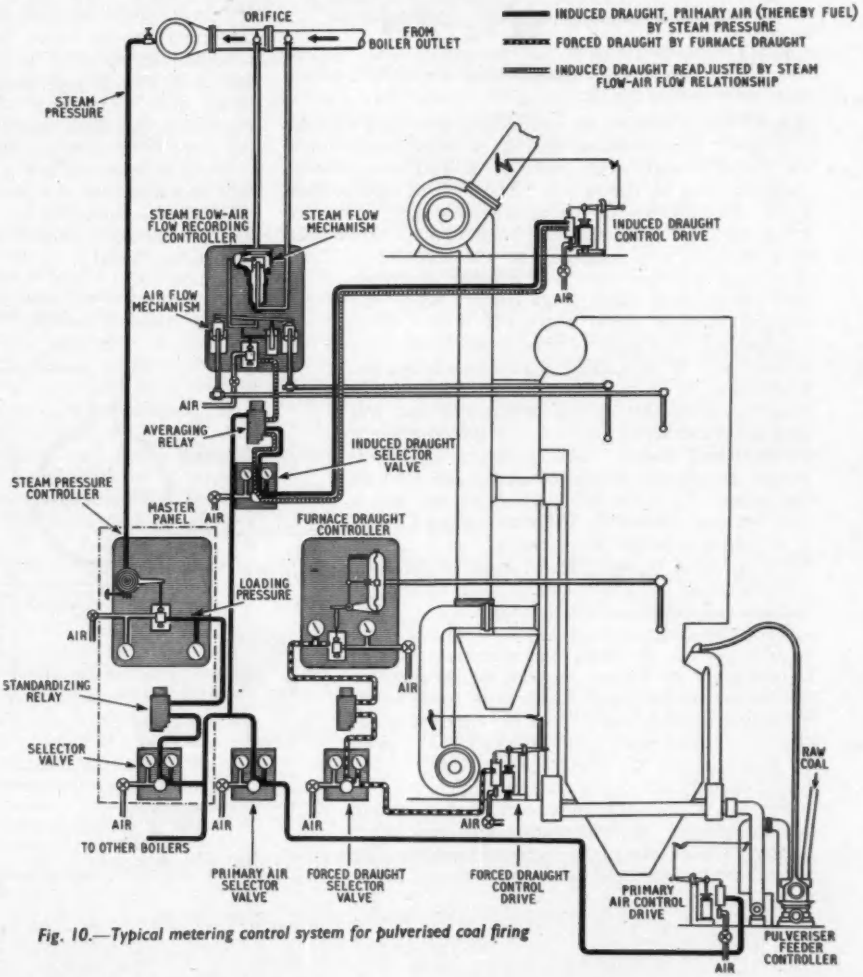


Fig. 10.—Typical metering control system for pulverised coal firing

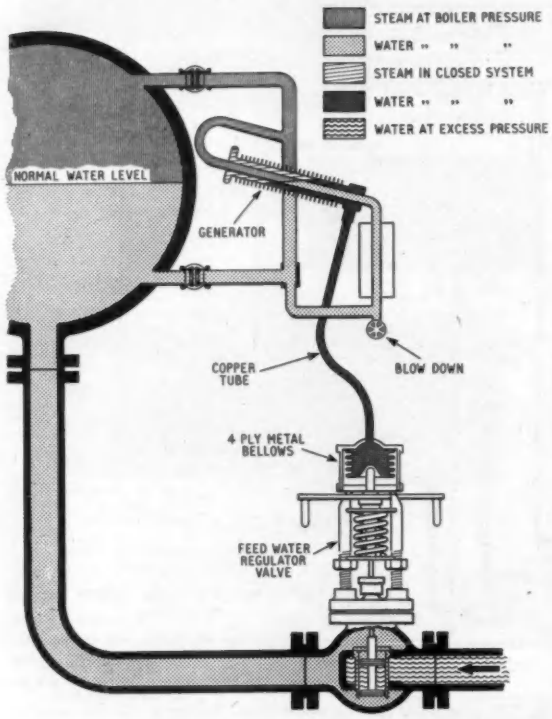


Fig. 11.—Example of thermo-hydraulic system of water-level control

troller" which meters the conditions connected with the auxiliary. This is exemplified by a damper controlling the forced draught. On increase in load, the pressure tends to drop in the boiler. The control system then sends out impulses to the individual power drives for increased firing. The forced draught damper would open to a position corresponding to the impulse received. Supposing we now introduce another controller into the system, which is in balance when the metered air-flow signal sent to it is in correct relationship to a signal received from the metered steam flow. If the amount of air which passes the forced-draught damper is not correct for the steam flow, the controller will be unbalanced and will send out a correcting signal to the forced-draught control signal system. This correcting signal will ensure the correct amount of air for the load on the boiler. This matching against steam flow is used because the amount of steam leaving a boiler at the correct temperature and pressure can be directly related to the B.Th.U. input of the fuel. This metering correction can be used on forced-draught and induced-draught control.

The main difficulty of this system lies in getting a truly correct air flow measurement. This is usually made by taking the pressure drop across the boiler passes (which varies with load) or by utilising a venturi, orifice plate or some means of creating a differential pressure which varies with air flow through the inlet or outlet ducts of the forced-draught fan. The first-mentioned method is affected by normal fouling of the boiler, leaking casing, opening of inspection doors and other factors which affect the flow of gases. The second method is usually more satisfactory and is commonly used. Fig. 7 shows typical results of metering control and Figs. 8, 9 and 10 show typical metering control layouts.

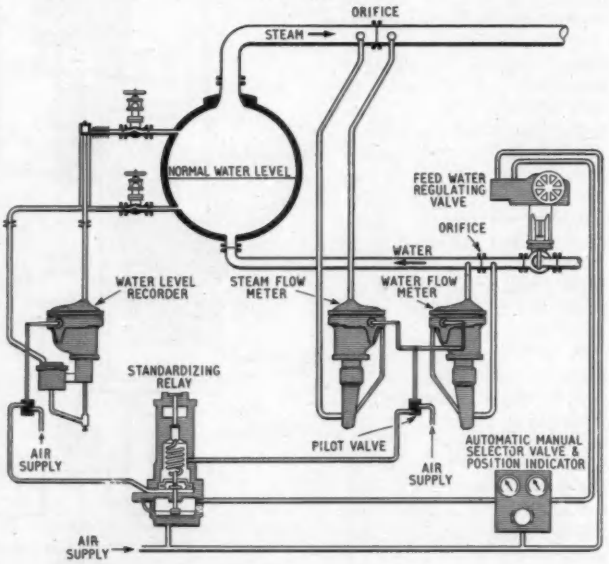
Most control systems are based on the main types reviewed. Each automatically controlled plant must be carefully surveyed as regards load, time of response to changes in firing and types of load change in order that the best system for the plant can be employed.

Steam-temperature control is generally a separate part of the control system. The measuring element, which is inserted into a pocket in the steam main, is usually a thermostat operating a pneumatic relay, a thermocouple coupled to a controlling potentiometer or some similar method of initiating the impulse which positions the power unit. Methods of controlling the temperature, which the power unit operates, are various. Spray type desuperheaters, surface type desuperheaters and superheater zone gas by-pass dampers are the most common.

With modern boilers of large steaming capacity, the storage space of water in proportion to steam output has been greatly reduced. With the rapid heat liberation of such boilers, great care must be taken to ensure that the water level is maintained. On boilers which are comparatively slow in steaming the thermo-hydraulic system is usually satisfactory. This system utilises a thermostat or generator connected to the boiler steam and water space, which sends an impulse, initiated by an alteration in level, to the feed valve. One such system is illustrated in Fig. 11.

For rapidly steaming boilers the thermo-hydraulic system is sometimes used in connection with a modifying impulse from the steam flow. This secondary impulse is sometimes obtained by taking the differential pressure across the superheater, as this bears a relationship to the steam flow. Reduction of "swell" is the reason for employing this development. A further improvement is the three-term control. Several methods are used, one of which is illustrated in Fig. 12. In this control the water flow is matched to the steam flow as the main elements. The impulse from this control is modified by the water level in the boiler before being passed on to the feed valve power unit.

Fig. 12.—Three-term control of water level with water flow matched to steam flow



In the system illustrated in Fig. 10 for pulverised fuel, the prime element is a sensitive measurement of the steam pressure. This initiates an impulse to the fuel supply system, increasing or decreasing the fuel as required. An impulse is also sent to the air controls, but may be modified by the steam-flow element in order to compensate for different fuels. This is accomplished by adjusting the air to the steam flow. The furnace is kept at a constant pressure independently. The water level is controlled by the level in the boiler, modified by the steam flow through the superheater in order to counteract "swelling" on load change. When such a system is properly "tuned" to a boiler, continuous supervision of combustion is made automatically and therefore continuous correction is applied.

Thus, attendants can devote more time to observing plant conditions. One reason for observation of furnace conditions is the necessity to alter the air-to-fuel ratio to meet the differing combustion requirements of various types of fuel. This control of ratio of fuel to air compensates conditions through the whole combustion range and is a necessary secondary adjustment of automatic control. Distribution of air is also usually made as a result of personal observations of furnace conditions.

The advantages of automatic control can be summarised as: maintenance of constant steam pressure and temperature within very close limits; greatly increased efficiency due to constantly supervised combustion; more time can be devoted to observation of plant by the operators; water level will be maintained within close limits.

Disadvantages are that some part of the automatic system may break down; skilled staff is required for maintenance; a sense of complacency may develop among operators so that some happening out of the ordinary will go unnoticed.

In reviewing the disadvantages, the following facts must not be overlooked. Automatic control systems are usually very well designed with components which have been simplified as far as possible; in practice, the author has found automatic combustion control systems to be notably reliable. On many installations skilled staff is already employed on supervising instrument maintenance. Any complacency can be obviated by a suitable training approach.

In conclusion, it is the author's opinion that automatic combustion control is a step forward. This is supported by the number of systems which have been, and are being, installed both in industry and power stations.

Engineering in Europe

THE insulation of rotating electrical machines is generally much less stressed by switching and atmospheric surges than the insulation of transformers. Windings of machines directly connected to the mains are mostly protected by series inductances, capacitances or surge divertors. The actual stresses imposed on the windings are mostly quite safely withstood by the winding insulation, vacuum-impregnated with asphalt or synthetic impregnating materials. This can be established by surge and h.f. testing the coils before assembling the machine.

The paper discusses the penetration of travelling waves into machine windings and, particularly, the often considerable effect of inductive couplings between various branches of the windings. The possibility of detecting short circuits to earth and turn-turn short circuits by tests with impulse voltages and currents and by obtaining oscillograms with probes inserted is considered. It is stated that these methods are not yet so reliable as to justify their general introduction and there is ample scope for further research into the problems of impulse withstand strength of electrical machines and methods of testing it.—"Surge-Testing the Insulation of Electric Machines," F. Liebscher and H. Meyer, *E.T.Z.(A)*, Vol. 78, No. 14, pp. 481-490, 11th July, 1957, in German.

Thermal Problems in Machines

The methods used hitherto for the solution of thermal problems in electrical machine design fairly teemed with over-simplifications, such as treating the problems as one-body problems, considering only one-dimensional flows, etc. It is true that such simplifications were more or less unavoidable owing to the intricacies of the problems and the insufficiency of the analytical methods which could be applied to them. However, the modern approach by electrical analogues, especially what are known as "dual" analogue circuits, proved to be more successful and, starting with steady-state problems, the author shows how such methods can be extended to unsteady problems, e.g. the heat flow in the armature winding of an electric machine. This is simulated by an iterated network consisting of active quadripoles of GL-type.

The current oscillograms obtained on the above analogue yield the time relation of the variations of the temperature field on a predetermined temperature-current scale. A useful representation of the temperature variations at selected points of the winding is so obtained, although the method applied still only considers the one-dimensional heat flow. There does not seem to be any theoretical reason, however, preventing the method from being applied to multi-dimensional problems if and when required.—"Electric Modelling of Unsteady Thermal States in Electric Machines," F. Provaznik, *Elektrotech. Obzor*, Vol. 46, No. 6, pp. 277-283, June, 1957, in Czech.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators, who will supply them at current rates.—Editors, *Electrical Review*.

I.E.S. Summer Meeting

WE have already published the list of papers to be read during the summer meeting of the Illuminating Engineering Society to be held from 11th to 14th May next at the Grand Hotel, Eastbourne (*Electrical Review*, 25th October, 1957, page 766). The Society has now published a leaflet giving the programme in greater detail.

The meeting will be officially opened by the Mayor of Eastbourne, who will also hold a reception on the first evening. Registration fees will be £1 10s for members and 15s for ladies; single days—members 10s, ladies 5s; non-members—whole meeting £2, single days £1. Pre-prints of the papers to be presented will be sent to all delegates. Those attending are asked to make their own hotel reservations, but overseas visitors can arrange accommodation through the secretary of the Society. Copies of the programme and reservation forms can be obtained from the Society at 32, Victoria Street, London, S.W.1.

Lighting Economics in 1958

A Comparative Analysis of Fixed and Running Costs

By G. V. McNEILL, A.M.I.E.E.*

MANY papers have already been published dealing with the comparative economics of electric light sources and it may therefore seem unnecessary to have yet a further comparison of relative costs. The important factor to allow for, however, is the inequality of technical and commercial progress which has taken place with various types of electrically energised light sources during the past decade.

The following table compares the 100 W tungsten filament lamp with the 5ft 80 W fluorescent tubular lamp and shows the variation in price, life and light output that has taken place between 1940 and 1957. It proves that while the 100 W filament lamp has altered little during the past seventeen years, the 5ft 80 W tube now provides as many lumen hours for a penny as the 1940 tube gave for a shilling.

Year	100 W Tungsten Filament Lamp				5ft 80 W Fluorescent Tube			
	Price	P. Tax	Life	Lumens	Price	P. Tax	Life	Lumens
1940 ...	2s 0d	Nil	1,000	1,150	36s 6d	Nil	2,000	2,160
1957 ...	1s 10d	4½d	1,000	1,230	13s 0d	2s 8d	5,000	4,320

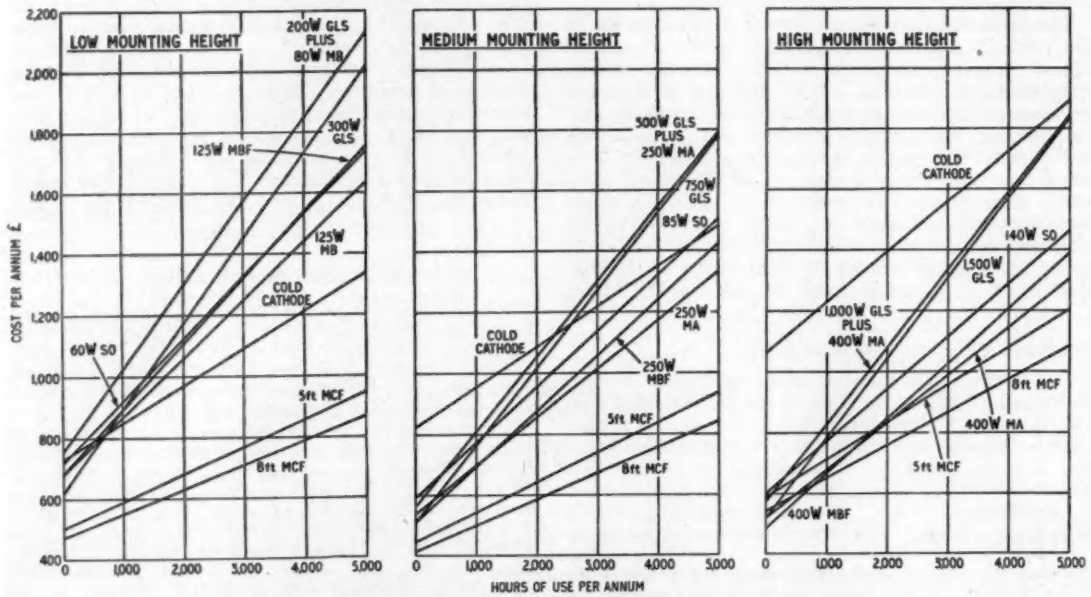
This inequality of progress in the development of light sources (which is perhaps natural in view of the length of time during which the tungsten filament lamp has been established) means that any comparison of costs prepared from data five or ten years old is obsolete. The object of this article is to give an up-to-date comparison of costs for the different types of electric light sources now in general use. The prices and data used in the comparison tables are those applicable to the lighting season of 1957/58. A method of comparing costs is also outlined in this article and a suitable correction can always be made to any section of the tabulated costs where local conditions show a marked deviation from the average value allowed.

In the accompanying tables costs have been prepared for eight different light sources; they are based in each case on a scheme designed to provide the same average illumination throughout a given industrial building. Each scheme uses the wattage of lamp, for each type of source, which is most suitable for low, medium or high mounting heights respectively. The results obtained in the three tables have been used for compiling the graphs of total annual cost.

Table 1 and Fig. 1 deal with a building where the mounting height of lighting fittings is between 8ft and 10ft above the bench tops. The second table and graph (Fig. 2) deal with fittings mounted at a height of 15ft to 20ft above the working plane, while the last table and graph (Fig. 3) deal with installations at 25ft to 30ft mounting height. The method used in compiling the total annual cost will now be explained step by step in the same order as the items appearing in each table.

Before dealing with costs, it is necessary to calculate

* Technical Sales Department, Atlas Lighting, Ltd.



Figs. 1, 2 & 3.—Annual costs of three industrial lighting schemes giving the same average illumination

the lumens required to provide the level of illumination called for. The building to be illuminated is 200ft long by 100ft wide and each scheme is planned to provide an average illumination of 20 lumens/sq ft over the entire working area. The wall and ceiling finishes have reflection factors of 30 and 50 per cent respectively. A maintenance factor of 0·8 is to be allowed for the reduction in light output, due to dust and dirt deposited on the light source or reflecting surfaces. This factor is based on a three-monthly interval between the cleaning periods.

From this information we can complete part of the

TABLE 1.—LOW MOUNTING HEIGHT (8 to 10ft)
ROOM INDEX—J. WALL AND CEILING FACTORS—30 and 50 Per Cent

Type of Lamp	Tungsten Filament	Blended Filament + Mercury	Fluorescent Mercury	Mercury	Sodium	Cold Cathode	Tubular Fluorescent	Tubular Fluorescent
Number and Wattage of Lamps per Fitting	1×300 W g.l.s.	1—200 W g.l.s. 1—80 W MB/U	1×125 W MBF/U	1×125 W MB/U	1×60 W SO/H	3×70 W 8ft 6in	1×5ft 80 W MCF/U	1×8ft 125 W MCF/U
Coefficient of Utilisation	0·61	0·61	0·61	0·61	0·61	0·70	0·72	0·72
Total Lamp Lumens Required	820,000	820,000	820,000	820,000	820,000	714,000	694,000	694,000
Total Number of Fittings	180	160	210	210	240	94	160	98
Total Lamp Lumens Provided	821,000	821,000	813,000	813,000	821,000	721,000	691,000	698,000
Total kW Loading	54·0	46·3	28·3	28·3	19·2	22·5	16·0	15·2
Total kVA Load	54·0	48·8	33·3	33·3	22·6	26·5	18·8	17·9
Fixed Costs Per Annum								
15% of Fittings Cost	£80 5 6	£247 3 0	£273 1 7	£273 1 7	£373 17 6	£354 15 3	£177 6 0	£167 3 0
10% of Installation Cost	£85 0 0	£85 0 0	£90 0 0	£90 0 0	£90 0 0	£90 0 0	£95 0 0	£87 10 0
Total Cleaning Cost	£72 0 0	£80 0 0	£84 0 0	£84 0 0	£96 0 0	£94 0 0	£96 0 0	£88 4 0
M.d. Charge at £7/kVA per Annum	£378 0 0	£341 12 0	£233 2 0	£233 2 0	£158 4 0	£185 10 0	£131 12 0	£125 6 0
Total Fixed Annual Costs	£615 5 6	£753 15 0	£680 3 7	£680 3 7	£718 1 6	£724 5 3	£499 18 0	£468 3 0
Running Cost Per 1,000 Hours								
Lamp Costs	£52 10 0	£78 12 0	£96 1 6	£73 4 9	£123 12 6	£28 0 10	£21 4 0	£15 3 10
Lamp Replacing Cost	£6 0 0	£6 8 0	£1 8 0	£1 8 0	£2 10 0	£1 8 2	£1 12 0	£1 7 6
Electricity at 1d/kWh	£225 0 0	£192 18 4	£117 18 4	£117 18 4	£80 0 0	£93 15 0	£66 13 4	£63 6 8
Total Running Cost per 1,000 Hours	£283 10 0	£277 18 4	£215 7 10	£192 11 1	£206 2 6	£123 4 0	£89 9 4	£79 18 0

TABLE 2.—MEDIUM MOUNTING HEIGHT (15 to 20ft)
ROOM INDEX—H. WALL AND CEILING FACTORS—30 and 50 Per Cent

Type of Lamp	Tungsten Filament	Blended Filament + Mercury	Fluorescent Mercury	Mercury	Sodium	Cold Cathode	Tubular Fluorescent	Tubular Fluorescent
Number and Wattage of Lamps per Fitting	1×750 W g.l.s.	1—500 W g.l.s. 1—250 W MA/V	1×250 W MBF/U	1×250 W MA/V	1×85 W SO/H	3×70 W 8ft 6in	2×5ft 80 W MCF/U	2×8ft 125 W MCF/U
Coefficient of Utilisation	0·56	0·50	0·56	0·56	0·56	0·65	0·66	0·66
Total Lamp Lumens Required	893,000	1,000,000	893,000	893,000	893,000	770,000	758,000	758,000
Total Number of Fittings	68	60	96	102	162	100	88	53
Total Lamp Lumens Provided	894,000	1,015,000	888,000	892,000	895,000	765,000	760,000	755,000
Total kW Loading	51·0	46·2	25·9	27·5	17·0	24·0	17·6	16·4
Total kVA Load	51·0	48·6	30·5	32·4	20·0	28·3	20·7	19·4
Fixed Costs Per Annum								
15% of Fittings Cost	£36 12 3	£111 15 4	£157 7 7	£167 4 4	£264 13 4	£377 8 1	£143 9 5	£132 17 3
10% of Installation Cost	£80 0 0	£80 0 0	£85 0 0	£87 10 0	£95 0 0	£100 0 0	£90 0 0	£80 0 0
Total Cleaning Cost	£40 16 0	£48 0 0	£57 12 0	£61 4 0	£97 4 0	£150 0 0	£70 8 0	£68 18 0
M.d. Charge at £7/kVA per Annum	£357 0 0	£330 4 0	£213 10 0	£226 16 0	£140 0 0	£198 2 0	£144 18 0	£134 8 0
Total Fixed Annual Costs	£514 8 3	£569 19 4	£513 9 7	£542 14 4	£596 17 4	£825 10 1	£448 15 5	£416 3 3
Running Costs Per 1,000 Hours								
Lamp Costs	£38 5 0	£48 7 0	£73 13 7	£42 13 5	£109 10 4	£29 16 8	£23 6 5	£16 8 7
Lamp Replacing Cost	£3 8 0	£3 12 0	£0 19 2	£1 0 5	£2 0 6	£1 13 4	£1 6 7	£1 1 2
Electricity at 1d/kWh	£212 10 0	£192 10 0	£107 18 4	£114 11 8	£70 16 8	£100 0 0	£73 6 8	£68 6 8
Total Running Costs per 1,000 Hours	£254 3 0	£244 9 0	£182 11 1	£158 5 6	£182 7 6	£131 10 0	£97 19 8	£85 16 5

TABLE 3.—HIGH MOUNTING HEIGHT (25 to 30ft)
ROOM INDEX—E. WALL AND CEILING FACTORS—30 and 50 Per Cent

Type of Lamp	Tungsten Filament	Blended Filament + Mercury	Fluorescent Mercury	Mercury	Sodium	Cold Cathode	Tubular Fluorescent	Tubular Fluorescent
Number and Wattage of Lamps per Fitting	1×1,500 W g.l.s.	1—1,000 W g.l.s. 1—400 W MA/V	1—400 W MBF/U	1—400 W MA/V	1—140 W SO/H	3×70 W 8ft 6in	2×5ft 80 W MCF/U	2×8ft 125 W MCF/U
Coefficient of Utilisation	0·46	0·41	0·46	0·46	0·46	0·52	0·53	0·53
Total Lamp Lumens Required	1,087,000	1,219,000	1,087,000	1,087,000	1,087,000	962,000	943,000	943,000
Total Number of Fittings	37	36	65	70	120	126	110	67
Total Lamp Lumens Provided	1,082,000	1,222,000	1,092,000	1,092,000	1,092,000	964,000	950,000	955,000
Total kW Loading	55·5	51·3	27·6	29·8	19·8	30·2	22·0	20·8
Total kVA Load	55·5	54·0	32·5	35·0	23·3	35·6	25·9	24·3
Fixed Costs Per Annum								
15% of Fittings Cost	£19 18 5	£78 1 3	£115 16 10	£124 15 0	£233 6 6	£475 10 7	£179 10 1	£167 19 3
10% of Installation Cost	£85 0 0	£85 0 0	£95 0 0	£100 0 0	£110 0 0	£130 0 0	£120 0 0	£105 0 0
Total Cleaning Cost	£29 12 0	£36 0 0	£52 0 0	£56 0 0	£96 0 0	£214 4 0	£110 0 0	£100 10 0
M.d. Charge at £7/kVA per Annum	£388 10 0	£378 0 0	£227 10 0	£245 0 0	£163 2 0	£249 4 0	£181 6 0	£170 2 0
Total Fixed Annual Costs	£523 0 5	£577 1 3	£490 6 10	£525 15 0	£602 8 6	£1,068 18 7	£590 16 1	£543 11 3
Running Costs Per 1,000 Hours								
Lamp Costs	£32 4 5	£38 15 10	£65 9 9	£32 0 6	£88 7 6	£37 11 10	£29 3 0	£20 15 5
Lamp Replacing Cost	£2 9 4	£2 17 7	£0 17 4	£0 18 8	£2 0 0	£2 16 0	£2 15 0	£1 13 6
Electricity at 1d/kWh	£231 5 0	£213 15 0	£115 0 0	£124 3 4	£82 10 0	£125 16 8	£91 13 4	£86 13 4
Total Running Costs per 1,000 Hours	£265 18 9	£255 8 5	£181 9 1	£157 2 6	£172 17 6	£166 4 6	£123 11 4	£109 2 3

calculation necessary in order to assess the total number of fittings and lamps required to produce an average illumination of 20 lm/sq ft. The lumen method formula used in this calculation is as follows:—

$$\text{Total lamp lumens} = \frac{\text{Floor area in sq ft} \times \text{Illumination required}}{\text{Maintenance factor} \times \text{Coefficient of utilisation}}$$

$$= \frac{20{,}000 \text{ sq ft} \times 20 \text{ lm/sq ft}}{0{\cdot}8 \times \text{Coefficient of utilisation}}$$

$$= \frac{500{,}000}{\text{Coefficient of utilisation}}$$

The coefficient of utilisation varies according to the mounting height and the type of light source and fitting used. The final part of the calculation is, therefore, included in the cost comparison tables, together with the coefficient of utilisation applicable to each light source and fitting. The number of fittings necessary has been calculated to give the nearest value to the "total lamp lumens required" associated with a practical lighting layout for the building.

Total Annual Cost

In arriving at the total annual cost of providing artificial lighting in the building, it is possible to divide the various items into "fixed costs," which are independent of the hours of use per annum, and "running costs," which are directly proportional to the operating period each year. The fixed costs and running costs have been calculated separately in the tables and the cost comparison graphs have then been prepared by allotting the fixed cost amount at zero hours and drawing a straight line from this point which increases, each thousand hours of operation per annum, by the running cost amount.

Fixed Costs

Fittings.—The fittings allowed for in the comparison of costs are all high-grade industrial reflector fittings of the dispersive or trough type. All discharge lamp fittings include power-factor-corrected control gear, and in the case of the 8ft and 5ft fluorescent tubular lamps this control gear is of the quick-start type. In calculating the "total cost of fittings," a proportion has been deducted from the list price to allow for discounts based on a medium-size user. Of this total cost of fittings 15 per cent has been taken as the annual amortisation of capital cost, depreciation and interest.

Installation.—In view of the large number of variable factors involved, it is very difficult to give a single value that would apply to every building of the same size. For this reason the total cost of the lighting installation given is purely nominal. It has been assumed, however, that the lighting installation comprises a run of 50ft in four-core p.i.l.c. cable, from a switch room near the factory to a distribution point at the centre of one of the main walls. Final circuits in v.r.i. cable are then run in trunking from this point across the centre of the shop, the final run to individual fittings being enclosed in screwed welded conduit. The annual amortisation of the lighting installation, apart from the fittings, has been taken as 10 per cent of the total installation cost.

Maintenance.—The annual maintenance cost for the complete lighting installation can be divided into two sections:—(*a*) cleaning the fittings and lamps, and (*b*) replacing used lamps. The cleaning cost in the tables is based on a three-monthly programme, i.e. four cleanings per annum, and this item of cost is independent of the operating period. The cost of replacement of lamps, however, is directly dependent on the hours of use and is, therefore, dealt with under running costs.

Electricity.—The most important individual factor affecting total cost per annum is the charge for electricity consumed, as can be seen from the tables. It is extremely difficult to allow an exact average value for the electricity charge as widely different tariffs may apply. For example, industrial tariffs for loads of 60 to 100 kVA vary considerably throughout the country, and the following two tariffs of different Area Boards show the degree of variation possible:—

(*a*) £5 per kVA of maximum demand per annum plus 0·825d/kWh.

(*b*) £12 10s per kVA of maximum demand per annum plus 1·25d/kWh.

The wide difference between these two tariffs makes it extremely difficult to give an average value that will be of practical use for all areas. In the cost comparison tables, therefore, an average figure of £7 per kVA of maximum demand per annum has been allowed plus a unit charge of 1d/kWh. A correction should always be made to the tables, however, when the local Area Board tariff differs widely from the average value quoted above, since this item may have quite a noticeable effect on the comparative economics.

It will be seen from the above comments that for most large installations the normal tariff is of the two-part type, consisting of a maximum demand charge plus a unit charge. In the cost comparison table, therefore, the m.d. portion is included in the fixed annual costs while the unit charge is regarded as a running cost.

Running Costs Per Thousand Hours

Replacement Lamps.—In compiling the total cost of lamps per thousand hours' use, a proportion has been deducted from the list price of the replacement lamps to allow for medium-size user discount. Purchase tax is included in the cost of the 5ft 80 W fluorescent tube and the 200 W tungsten filament lamp. In the case of the blended filament plus mercury source the rated lamp life is shown as 5,000 hours and the "list price of lamps per fitting" therefore includes five tungsten filament lamps (of 1,000 hours' life), plus one mercury discharge lamp. In the case of the sodium source, the list price allows for the two-part lamp with separate outer vacuum jacket. Since this jacket normally outlasts three of the inner lamps, the lamp cost includes only one-third of its price.

Lamp Replacement.—If the cleaning programme for the fittings can be arranged to coincide with the period for lamp replacement then group renewal of all lamps is economical, since they may be replaced without extra cost at the same time as the fittings are being cleaned. The replacement cost in the tables is based on group replacement, but if lamps are to be replaced individually as they fail, the costs shown in the tables should be increased tenfold. In the case of the blended filament plus mercury source, the replacement cost is calculated for a period of 5,000 hours and, therefore, includes the replacement of five tungsten filament lamps plus one mercury discharge lamp.

Electricity Charge.—The final item of running cost allows for the charges for electricity consumed. The average value used in the table, of 1d/kWh, allows for an easy conversion to any other value where the local unit charge is either higher or lower than a penny.

From an examination of the three cost comparison graphs it will be seen that for buildings with a low mounting height the tubular fluorescent lamp is by far

the most economical, even allowing for low hours of use per annum, and that the 8ft 125 W tube is more economical than the 5ft 80 W tube. It is for this reason that the 8ft tube has been included in the comparison, although the 5ft tube is the most popular size to-day. There seems little doubt, however, that the present economic advantages of the 8ft tube will soon increase its relative popularity.

It will also be seen from the graphs (Figs. 1 to 3) that whereas the cold cathode tubular light source is reasonably economic at low mounting heights it becomes less so as the mounting height increases. A further point is that as the wattage rating of the tungsten filament and the sodium and mercury discharge lamps increases, they become relatively more efficient and the difference in total cost between these sources and fluorescent tubular lamps is reduced. In the case of Fig. 3 it will be seen that at high mounting heights, and with low annual hours of use, the 400 W MBF/U fluorescent mercury lamp is the most economical.

Qualitative Factors

After determining the economic suitability of a light source, very careful consideration must be given to the various qualitative factors such as source brightness, glare, colour rendering, starting characteristics, mains flicker and ease of maintenance. This important part of the lighting problem is, however, beyond the scope of this article, but the need for a detailed examination of the qualitative factors cannot be stressed too strongly, since no lighting scheme should ever be accepted purely on economic grounds.

Nuclear Reactor Simulator

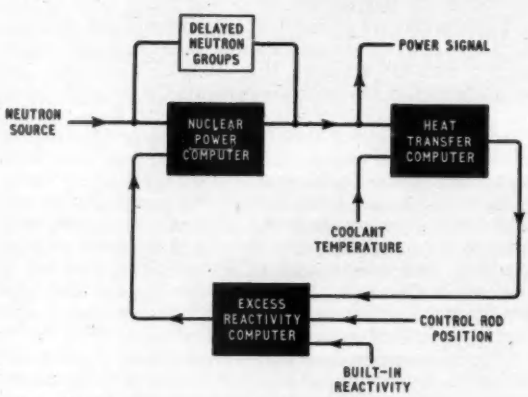
Apparatus for Training Operators

A SIMPLE nuclear reactor simulator for training purposes has been produced for the commercial market by the Control and Electronics Department of the English Electric Co., Ltd., at Kidsgrove. Basically, the simulator comprises a simple analogue machine capable of solving certain fundamental equations which represent the actions of a reactor under operating conditions, with means of controlling or varying these actions so that operators can acquire the "feel" of the reactor control system.

The simulator is housed in a steel-framed cubicle 6ft high by 2ft wide by 2ft deep. The cubicle is sub-divided into three separate sections, the top section containing five computing amplifier units and a servo multiplier-amplifier unit all built on withdrawable type chassis. Only four of the computing amplifier units are normally in operation, the fifth being a spare. Automatic drift correction has not been incorporated in the computing amplifier units, but provision has been made for this adjustment to be carried out manually. A set-zero switch and associated screwdriver-adjusted potentiometers are mounted on the front panel of each amplifier unit and the amplifier outputs can be monitored by a meter.

The control system is mounted in the centre section of the cubicle and control facilities and indicating meters are all mounted on the face panel associated with this section. These facilities include selector switches for setting up the various reactor parameters. A table-top is fitted immediately below the control panel, at approximately desk-top height, for the operator's use.

The lower section of the cubicle contains the power units which provide h.v. and l.v. supplies to the computing amplifier units and are fed from single-phase 50 c/s mains.



Block schematic diagram of closed-loop arrangement

Operation

The reactor equations are simulated by three basic computer elements: the nuclear power computer, the heat transfer computer and the excess reactivity computer. These elements are connected in a closed loop circuit which has provision for certain signals to be injected at required points. A block schematic diagram of the arrangement is reproduced.

Signals representing "built-in reactivity," "fuel temperature" and "control rod position" are fed into the excess reactivity computer which, from this information, produces the δK signal. The position of the control rod may be varied transiently, or by a fine manual control, or may be set to move at a required velocity.

The δK signal, together with a neutron source signal, set at the control panel, constitute the input information to the nuclear power computer. This unit comprises a d.c. amplifier which, when fed with this information, simulates the appropriate transfer function and the delayed neutron effects. Delayed neutron networks, appropriate to the fuels selected, are set by the "select fuel" potentiometers on the control panel.

The loop is closed by feeding the nuclear-power signal from the output of the nuclear power computer to the input of the heat transfer computer, with a signal representing the coolant input temperature.

A significant feature of this unit is the incorporation of a "mass flow" control which may be used to illustrate how the power of a reactor can be controlled by coolant mass flow.

Trip circuits have been incorporated in the circuit and can be set to simulate shutdown at a pre-set level or at some defined rate of increase of the power level.

TESTING 132 kV CONDENSER BUSHINGS

THE discussion on the paper presented before the Institution of Electrical Engineers by Messrs. J. L. Douglas and A. W. Stannett entitled "Laboratory and Field Tests on 132 kV Condenser Bushings," which was summarised in our last issue, was opened by Mr. F. C. Walmsley (Micanite Insulators). The assessment of techniques of measurement and methods of detection, he said, could be related to two principal factors—moisture and erosion due to discharge. The former tended to change the state of insulation but not the dimensions and the latter changed the operative dimensions. The first illustration of the type of bushing examined was disturbing, but faith was restored by the final statement that only 4 per cent of the bushings tested on site were faulty and only 3 per cent were in doubtful condition. In the light of present knowledge, it was not surprising that some of the bushings were defective.

Dr. J. S. Forrest (Central Electricity Generating Board) stated that the work was part of a programme of research covering many years and the paper was a sequel to one on insulator testing read sixteen years ago. The authors had made two notable advances. They had elucidated completely and satisfactorily for the first time the cause of the drooping power-factor characteristic. Secondly, they and their colleagues in the Divisions had tested 1,600 132 kV bushings and had found some 60 faulty bushings, which were being taken out of service. This was a major contribution to continuity of supply.

Mr. P. G. Ashley (Metropolitan-Vickers Electrical Co.) said that the authors' results were similar to his own experience. He showed slides illustrating tests he had made indicating that their record was good. It was something to be proud of, seeing that the bushings in question were made in 1929-1931.

Mr. W. J. Brown (Bushing Co.) agreed that the industry could take pride in its record. The power-factor/voltage test became general amongst bushing makers in about 1935, and it would be difficult for engineers who were not manufacturers of bushings to realise its impact and influence. Before its introduction bushing making was an art; afterwards it became a science. As he saw it, the only hazard now—provided bushings were made to British Standard specification—was moisture or lightning.

Mr. D. M. Cherry (Central Electricity Generating Board) said the work of the authors had been of great value to the supply industry and he hoped it would prove useful to the manufacturing side. Bushing design and manufacture had changed a great deal but much could be learnt from even obsolete designs. Ability to assess the life of old insulation might obviate busbar faults and save unnecessary replacements.

Mr. W. G. Todd, speaking as an engineer who had at one time been responsible for supplying the authors with material, thanked them for what they had done not only for the South Eastern Division but for all Divisions. He had sometimes felt he was asking too much of them but they raised no objections. As the investigation proceeded they were able to say quite positively which bushings were good and which bad, and which could remain in service for a time for subsequent test.

Mr. J. H. Mason (E.R.A.) regarded as very satisfactory the authors' conclusion that insulation resistance and capacitance measurement could detect bushings that were deteriorating. He asked whether the failures per annum had been reduced since the programme was introduced. He described tests carried out on small-scale tubular bushings of simple design.

Mr. F. W. Taylor (Ferranti) considered 4 per cent faulty and 3 per cent doubtful bushings to be a very good record, indicating that the mean life of the bushings was much more than twenty-five years. Unfortunately, advantage could not be taken of this knowledge or of improvements in design and manufacture because of standardisation. No one wanted two not very different bushings for the same service.

Mr. N. Parkman (E.R.A.) referred to two points that arose from the paper. The first was how to account for the low inception voltage for bushings with large cavities. The second was the difference in the information provided by power-factor/voltage measurements and discharge measurements. The question was why some discharges caused a great deal of erosion and others did not.

Mr. C. W. Mott (Central Electricity Generating Board) doubted whether the supply industry could afford to do anything like the amount of testing it was being asked to do. Interpretation of results was more important.

Mr. W. A. Cook (Micanite & Insulators) said that it would have been surprising if the tests had shown better results in the light of what was now known about the conditions that arose in bushings. Mr. Brown had put the matter very clearly and the position was analogous to that of the big bridge builders in the nineteenth century who designed and built their bridges without any knowledge of the dire consequences of the fatigue of metals. The most important development was the introduction of the power-factor/voltage test.

Mr. K. H. Stark (English Electric Co.) pointed out that a very convenient instrument for measuring the presence of moisture in paper was the E.R.A. dispersion meter. If discharges were responsible for deterioration, why had not the authors suggested a simple test for detecting severe discharges?

Unsteady-State Heat Transfer

THE problem of unsteady-state heat transfer, of which the regenerative heat exchanger is a practical example, is dealt with from both its theoretical and practical aspects by Dr. T. D. Patten in a communication to the Institution of Mechanical Engineers.

Descriptions are given of experiments in which air flows vertically upwards through a single tube of circular cross-section and the resulting heat transfer coefficients are measured. These results are presented in graphical form and are then compared with theoretical heat transfer coefficients for steady-state heat transfer predictions for the same physical arrangement and for the prescribed tube wall temperature conditions. The experiments were made with values of Reynolds numbers between 1,000 and 2,500 within which range the processes of heating and cooling reveal similar heat transfer properties. Where the tube wall temperature is either constant or has a uniform gradient the Nusselt number agrees with that predicted for steady-state heat transfer for the same wall temperature distribution.

The investigation deals both with single-cycle operation, in which the air supply is either hot or cold, and with cyclic operation as in a parallel-flow regenerator. In both cases the heat transfer coefficients are of the same order.

VIEWS on the NEWS

By REFLECTOR

WHILE the Central Electricity Generating Board continues to incur the displeasure of the amenity societies it finds champions elsewhere when it proposes to erect its generating stations and transmission lines. The Council for the Preservation of Rural Wales is one of the bodies protesting against the placing of a nuclear power station at Trawsfynydd, North Wales. Now, in turn, trade unions are protesting against the Council for seeking to ban a project which will give much-needed employment in the North Wales area. Mr. Tom Jones, secretary of the North Wales area of the Transport and General Workers' Union, is reported by the *Western Mail* as saying:—

> "Because of the opposition they have put up they have caused the scheme to be delayed for 12 months. That is a crime when we have so much unemployment in North Wales. No one wants to destroy the beauty of Caernarvonshire but if we have to do some little harm to beauty in order to provide food for the people living here we must do so."

But why is it always taken for granted that these works will ruin the scenery? Some of them will bring interest to wild wastes of questionable beauty and make the desert rejoice and blossom as the rose.

* * *

In view of the fact that local authorities are responsible for a great deal of electrical installation work, particularly in the field of housing, I was surprised to read that the Association of Municipal Corporations does not feel that any useful purpose would be served by its becoming a member of the National Inspection Council for Electrical Installation Contracting. In a report on the subject, the Association's General Purposes Committee says that it is sympathetic to the aims of the N.I.C., but does not think that the Association is in a position to further them. One approach, mentioned at the annual meeting of the Council, would be in ensuring that local housing authorities which allot contracts to the lowest tenderers should pay particular attention to the quality of electrical installations. Referring to the membership list of the N.I.C., I notice that the Convention of Royal Burghs is represented on the Council's Scottish Committee.

* * *

As a counterblast to the production of electricity from nuclear reactions—fission and fusion—the gas industry is aiming to produce cheaper gas derived from oil. Work is in hand at the Solihull (Warwicks) gas research station which, according to the *Birmingham Mail*, will result in "cheaper gas and spectacular new production processes that will remove the industry's dependence on expensive coal." But it leaves the industry dependent upon fairly expensive and imported oil. Another important development, it is said, involves the use of "small dirty coal at present unsaleable." I do not understand why the word "unsaleable" is used, for the electricity supply industry has been buying it for a long time. Is the gas industry seeking to deprive it of one of its staple raw materials?

* * *

At the risk of being accused of overdoing gas in this week's notes I feel that I must put on record a Gas Board's generosity in lending its theatre at Eastbourne for a public meeting called by the local Chamber of Commerce which was addressed by an officer of the South Eastern Electricity Board. The meeting was held to protest against higher prices of electricity for industrial premises.

* * *

Mr. G. Haythornthwaite, of Sheffield, writes to the *Manchester Guardian* saying that "the National Parks Commission aims at improving our environment—the C.E.A., according to its advertisements, sought to avoid its responsibilities in this direction." He goes on to suggest that the Commission should be given an "equalising grant" of £50,000 which, he says, is the sum spent by the C.E.A. on Press advertisements in the last two months of 1957. Mr. Haythornthwaite does not say whence the grant should come. Surely not from the Central Electricity Generating Board—the C.E.A.'s successor.

* * *

A survey of the possibilities of electric cooking and heating was published in the *Electrical Review* of 4th February, 1898. The author, a Mr. W. P. Adams, advocated the development of this load as a means of providing daytime employment for generating plant which was then used almost exclusively for lighting purposes. Mr. Adams thought that in a kitchen suitable for supplying the needs of from eight to ten persons (families were larger in those days), the following apparatus would be necessary:—

> "Oven, absorbing 2,500 watts when heating up for about 15 minutes, and on the average 1,200 watts afterwards. Breakfast cooker, wound for two circuits, each absorbing 600 watts. Two grillers, each wound for 500 watts. Two frying pans, also wound for 500 watts, and several hot plates for warming ordinary saucepans, or in place of these several self-contained electric saucepans. These plates or saucepans would probably absorb 1,500 watts together. . . . The total watts which could be absorbed by the cooking apparatus is 7,200. It must, however, be borne in mind that these various appliances are used at different times, and never altogether."

Mr. Adams thought that this would be a worthwhile load but it could be secured only if the supply authority charged a lower price than it did for lighting. He mentioned that he himself was being charged 8d a unit by the City of London Electric Lighting Co.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The South of Scotland Electricity Board announces that following the retirement of **Mr. J. A. Aked** from the service of the Board **Mr. G. S. Wilton,** B.Sc., A.M.I.E.E., has been appointed transmission engineer in the Chief Engineer's Department. Mr. Wilton is at present principal engineer in the Transmission Section.

Mr. A. H. Campbell, C.A., divisional accountant of the North West, Merseyside and North Wales Division of the C.E.A. since April, 1954, has been appointed deputy chief financial officer of the Central Electricity Generating Board. From 1948 until 1954 he was divisional accountant of the Merseyside and North Wales Division. Mr. Campbell was educated at Glasgow High School and qualified as a chartered accountant in Glasgow. In 1932 he entered the service of the Central Electricity Board in the Mid-East England Area as an assistant accountant, and in 1946 he joined the Yorkshire Electric Power Co. group as senior assistant in the Accounts Department.

Mr. A. H. Campbell

If Britain was to keep her place in the world the Government might have to subsidise the development of electronic engineering, said Mr. G. A. Marriott, president of the **British Institution of Radio Engineers** and a director of the General Electric Co., Ltd., when he spoke in Glasgow on 31st January at the annual dinner of the Scottish Centre of the Institution. There was no doubt that America indirectly subsidised development and scientific work in electronic engineering, he said.

Mr. J. S. Pickles, chairman of the South of Scotland Electricity Board, who proposed the toast to the Institution, said that the nuclear power station under construction at Hunterston, Ayrshire, because of its enormous number of instruments, would need many recruits in electrical mechanics. A number of the Board's engineers were now undergoing a four-year training course and, on the average, the Board would be deprived of forty engineers for a period of six months each.

Major-General S. W. Joslin, works manager, Dounreay, Caithness, said that in Dounreay there were 3,500 electronic instruments that had to be maintained. As instrument mechanics were not obtainable, the Atomic Energy Authority had to recruit fitters and electricians and train them.

Camp Bird, Ltd., announces that **Mr. B. R. A. Homfray Davies** has resigned as managing director of Camp Bird Industries, Ltd., and as chairman and joint managing director of Hartley Baird, Ltd. **Mr. C. Collaro,** O.B.E., who was recently appointed chairman of Camp Bird Industries, Ltd., succeeds Mr. Homfray Davies as managing director of that company, and as chairman of Hartley Baird, Ltd.

Mr. E. Goodhew, M.I.E.E., chief electrical engineer in charge of laboratories at Philips Croydon Works, Ltd., recently celebrated the completion of twenty-five years' service with the Philips organisation. Mr. G. D. van der Zee, plant director, presented Mr. Goodhew with a gold watch and a cheque, the gifts of the board of management. Other presentations of an electric toaster, a fitted cocktail cabinet, books and a pipe were made on behalf of friends and colleagues.

Mr. W. E. N. Gwilt, managing director of the Sturtevant Engineering Co., Ltd., is retiring at the end of April, and as from that date **Mr. H. W. Wagner** has been appointed deputy chairman and joint managing director, and **Mr. A. B. Davies** joint managing director.

Mr. L. A. Stevens has been appointed manager of a newly formed material handling department of F. Perkins, Ltd., Peterborough. He will be directly responsible to the deputy general manager of the manufacturing division.

Mr. J. I. Paton has been appointed sales manager of Carron Company. He will be responsible for the co-ordination of the whole of the sales of the company, and will assist the manager in directing sales policy. **Mr. S. R. Rogers** takes over the duties previously carried out by Mr. Paton and is appointed assistant sales manager (foundries).

Mr. J. I. Paton

Mr. S. R. Rogers

The examination for the E.A.W. certificate in electrical housecraft for demonstrators and teachers is held twice yearly, and the results of the December examinations are announced. At the 42nd certificate examination for demonstrators, 59 candidates were successful, 4 gaining distinction. The total number of certificate holders is now 2,779. At the 39th certificate examination for teachers, 52 candidates were successful, 6 gaining distinction. The total number of certificate holders is 2,213.

The E.A.W. diploma for demonstrators has been awarded to **Mrs. P. E. Jones** (late of the Midlands Electricity Board, Evesham); **Mrs. M. R. Baker** (London Electricity Board, Bromley); **Miss M. E. Maddock** (Eastern Electricity Board, Wisbech); and **Miss S. M. Hall** (Yorkshire Electricity Board, Kingston-upon-Hull).

Mr. J. W. Malbon, who writes in this issue (page 243) on "Automatic Boiler Control," was educated at Gateshead Grammar School and continued his studies at the Mid-Essex Technical College. After a period with Crompton Parkinson, Ltd., when he was engaged on switchgear and instrument test work, he joined Thomas Hedley & Co., Ltd., as an instrument mechanic and later became development engineer on automatic air conditioning. His next appointment was with the London Division of the Central Electricity Authority as an instrument engineer at Barking "C" generating station, and he is at present an instrument engineer at the Tilbury generating station, Eastern Division, C.E.G.B. For the past 16 years Mr. Malbon has been a part-time instructor at Thurrock Technical College.

Mr. J. W. Malbon

The Postmaster General has announced the names of the members of the new Frequency Allocation Committee, the chairman of which, as we have already reported, is Sir Lawrence Bragg. The members include **Sir Harold Bishop** (B.B.C.); **Mr. J. R. Brinkley** (Pye Telecommunications);

Mr. J. Clarricoats (Radio Society of Gt. Britain); **Sir Robert Fraser** (I.T.A.); **Mr. T. E. Goldup** (Mullard), **Mr. K. I. Jones** (Cossor Radio & Television) and **Mr. R. J. Kemp** (Marconi's Wireless Telegraph Co.), nominated by the Radio Industry Council; **Mr. M. van Hasselt** (Standard Telephones & Cables), nominated by the Telecommunication Engineering and Manufacturing Association; **Mr. G. F. Peirson** (Midlands Electricity Board), nominated by the nationalised fuel and power industries; and **Dr. R. L. Smith-Rose** (D.S.I.R.).

Mr. E. G. James, B.Sc., A.M.I.E.E., retired on 31st January after thirty-nine years' service with the British Thomson-Houston Co., Ltd., Rugby. Mr. James spent most of his career in the Industrial Engineering Department but for the past two years has been personal assistant to Mr. G. S. C. Lucas, director and chief electrical engineer.

Mr. E. G. James

Mr. James received his technical education at West Ham Technical Institute, where he gained the London University external B.Sc. degree. He served his apprenticeship with the British Westinghouse Electric & Manufacturing Co., Ltd. (now the Metropolitan-Vickers Electrical Co., Ltd.), and afterwards joined H.M. Forces, serving in France with the Royal Engineers. On demobilisation he went to Rugby and in 1919 joined the B.T.H. Publications (now Publicity) Department. Mr. James was transferred in 1922 to the Industrial Engineering Department, remaining there for thirty-three years, during which he became section leader of the Paper, Printing and Textile Section. In 1955 he was appointed personal assistant to Mr. Lucas. He is a member of the Rugby Engineering Society, and for some years was assistant secretary.

The South Wales Association of the Engineering and Allied Employers' Federation presents annually a number of awards to apprentices from South Wales factories. Five awards are given, one for each year of apprenticeship. This year, out of the five age-group prizes awarded, apprentices of **South Wales Switchgear, Ltd.,** have won the first and last (the 16-17 years and 20-21 years). These go respectively to Mr. G. K. Thomas and Mr. M. D. Miles.

Mr. Thomas has been an apprentice at the Treforest transformer factory since October, 1955; he was awarded an I.E.E. scholarship to Glamorgan Technical College in the summer of 1957 and has been selected to do a sandwich Higher National Diploma course at that college. Mr. Miles has just completed his apprenticeship at Blackwood and has previously won an Employers' Federation award in 1953 and an award from the Industrial Association of Wales and Monmouthshire in 1956.

The prizes were presented recently by the Lord Mayor of Cardiff, Alderman J. H. Morgan, at a luncheon in Cardiff.

Mr. W. E. Wright, F.C.S., retired from the board of the Pyrene Co., Ltd., and from control of the Metal Finishing Division at the end of last year, and **Mr. H. F. Parshall,** M.A., T.D., who has been on the board since 1947, has now taken over board responsibility for that division.

Sir George H. Nelson, Bt., the chairman of the English Electric group of companies, has been appointed president of the Locomotive and Allied Manufacturers' Association of Great Britain for the ensuing year. **Mr. G. T. Owen,** managing director of the North British Locomotive Co., Ltd., has been appointed chairman of the Association.

Mr. T. H. R. Perkins, director and general manager of the sales division of F. Perkins, Ltd., is visiting India for business discussions with Simpson & Co., Ltd., of Madras, who are manufacturing Perkins diesel engines under licence.

Mr. W. T. Scutt has been appointed sales manager to H. N. Southorn (Engineers), Ltd., of Solec Works, Church Lane, West Bromwich, who are in the process of marketing a new clothes drying cabinet.

Mr. G. V. McNeill, A.M.I.E.E., whose article, "Lighting Economics in 1958," appears in this issue (page 248), is with the Technical Sales Department of Atlas Lighting, Ltd. He joined "Atlas" in 1952 and is responsible for technical sales matters relating to the application of discharge lighting equipment, including fluorescent tubular lamps. Although only 31 years of age, he has already established a reputation as a lecturer on fluorescent lighting. He was awarded the A.S.E.E. Highfield Shield for the best technical paper, both in 1955 and 1956.

Mr. G. V. McNeill

Mr. McNeill gained his general electrical engineering education through evening class studies at the South-East London Technical College, and he was awarded the College's first prize for the O.N.C. and H.N.C. examination results. Subsequent studies in illuminating engineering were taken at Northampton Polytechnic and in 1956 he was awarded the City and Guilds silver medal for his results in the final examination in illuminating engineering. He is at present giving lectures at the School of Building, Brixton, and, on behalf of the Illuminating Engineering Society, lectures to London schoolchildren on "Light and Sight."

On his appointment as finance manager, **Mr. A. D. Smart** has relinquished the post of secretary of the British Oxygen Co., Ltd., and is succeeded by **Mr. B. R. D. Clark.**

Mr. D. W. Kaye, managing director of the Thames Wire & Cable Co., Ltd., sailed yesterday (Thursday) in the *Athlone Castle* for Cape Town. He is touring the Union and then going on to Southern Rhodesia. Mr. Kaye hopes to be back in England in April.

Mr. B. A. Hensler has been appointed to the board of Siemens Edison Swan, Ltd. Mr. Hensler, who is managing director of Siemens Edison Swan (Export), Ltd., is also a director of the company's overseas subsidiaries, and Associated Electrical Industries (Overseas), Ltd.

Mr. B. A. Hensler

He joined Siemens Bros. & Co., Ltd., in 1929, and was engaged on design, development, and laboratory work on telephone exchange systems. From 1939 to 1945 Mr. Hensler was concerned with production control of radar calculator equipment and technical liaison work on airborne and other types of radar. In 1945 he was appointed head of the telephone exchange development division and in 1952 he became assistant to the chief engineer. In 1954 he was made general manager and chief engineer of Siemens' telephone branch and a year later became assistant to the technical director.

Since the war Mr. Hensler has travelled extensively on behalf of the company.

The annual ball of the West Yorkshire area of the **Electrical Industries Benevolent Association** will be held on 28th February at the Cairn Hydro, Harrogate. Applications for tickets (27s 6d each) should be made by 20th February to Mr. J. M. Ellis, 4, New York Road, Leeds, 2.

Reynolds TI Aluminium, Ltd., which was formed in November last to combine the interests and activities of Tube Investments, Ltd., and the Reynolds Metals Group of the United States in the aluminium industry in the United Kingdom, has announced the following board appointments:—Sir Ivan A. R. Stedeford, K.B.E. (chairman), Mr. R. S. Reynolds, junr. (alternate chairman), Lord Reith, P.C.,

and Messrs. W. G. Reynolds, J. L. Reynolds, J. H. McConnell, A. J. S. Aston and R. D. Young. Mr. P. R. McGehee has been appointed chief executive (manufacturing and technical) and Mr. B. James, chief executive (sales).

Mr. A. A. Kay, A.M.Brit.I.R.E., has been appointed assistant chief engineer of the Radio and Television Division of the Plessey Co., Ltd. Before joining the company he was manager of the Engineering and Development Department of RCA Great Britain, Ltd., and previously he had been deputy head of the Radio and Television Development Department of Ultra Electric, Ltd.

Mr. H. C. R. Allday, late of S. O. Bowker, Ltd., has joined Metway Electrical Industries, Ltd., as sales supervisor, in which position, the company says, he will supervise sales from an outside point of view, particularly the small wiring accessories side of the business.

Mr. H. C. R. Allday

West Midland members of the former E.L.M.A. Lighting Service Bureau recently attended a farewell luncheon to **Mr. A. H. Adey,** for many years manager of the Birmingham Branch of the Edison Swan Electric Co., Ltd., held at the Saracen's Head, Balsall Common, to mark his retirement. A gift was presented to Mr. Adey by Mr. H. Winter on behalf of those present, and Mr. Adey, in his reply, stressed how much he valued this friendly gesture, particularly as it came from competitors. He hoped that the good spirit engendered in the Midlands would continue.

Mr. S. V. Spear, formerly export manager of Smart & Brown (Engineers), Ltd., has been appointed managing director of Spear Bros., Ltd.

Messrs. R. F. Hemmings and **B. S. Liley,** of the A.E.I. Aldermaston Research Establishment, are members of a British delegation to a thermonuclear conference held in Washington this week.

The National Golf Finals of the **Electrical Industries Benevolent Association** will be held this year in the London area. They have been arranged to take place on Monday, 29th September, on the Wentworth Golf Course, Virginia Water, Surrey. The dinner in the evening will be held at the Park Lane Hotel, London, W.1.

The Berks., Bucks. and Oxon Branch of the Electrical Industries Benevolent Association will hold its annual ball at the "Olympia" Ballroom, Reading, on Friday, 14th March. The annual general meeting will be held at the Southern Electricity Board offices, Market Place, Reading, on Tuesday, 18th March.

The annual ball of the Birmingham and District Branch of the Association will be held on Friday, 28th March, in the ballroom of the Tube Investments Social Club, Oldbury (8 p.m.). Tickets (10s each) may be obtained from the hon. secretary, Mr. G. D. Rogers, Electrical Trades Supply, Ltd., Loveday Street, Birmingham, 4 (telephone: Ast. 5671).

The annual general meeting of the North Metropolitan Branch of the E.I.B.A. will be held at Northmet House, Southgate, N.14, on Friday, 21st February, at 3.30 p.m.

The annual dinner and dance of the **Telcon Staff Association** (Telegraph Construction & Maintenance Co., Ltd., and Submarine Cables, Ltd.) was held at the Dorchester Hotel on 31st January. Mr. W. R. Martin, personnel manager and chairman of the Association, presided over a gathering of more than 420 members and their friends. The toast to the company was proposed by Mr. T. B. Rose, production superintendent, and in his reply Sir John Dean, chairman of Telcon, was optimistic about the future prospects. The toast to the Association was proposed by Dr. E. W. Smith, director, and Mr. W. R. Martin responded. The guests included Mr. W. F. Randall and Mr. J. Innes, C.B.E. (directors), Mr. L. J. Gray (managing director, Toolpro, Ltd.) and Mr. G. T. W. Whitehead (director, Johnson & Phillips, Ltd.).

The **Ex-Johnson & Phillips Association** is holding its annual reunion dinner on Saturday, 1st March, at Grosvenor House, Park Lane, London, W.1. Past members of the J. & P. staff who are not members of the Association and would like to attend the dinner are invited to write for particulars to Mr. S. W. Foakes, hon. secretary of the Association, 22, Maddison Gardens, Bexleyheath, Kent.

The inaugural dinner of the "20 Club" of **W. Canning & Co., Ltd.,** was held on 23rd January, 250 employees and ex-employees being present. Sir Ernest R. Canning was elected president and silver badges were issued to mark the formation of the Club, membership of which is attained by twenty years' service with the company. Out of a total of approximately 2,000 employees 12½ per cent have been with the company for twenty years or more.

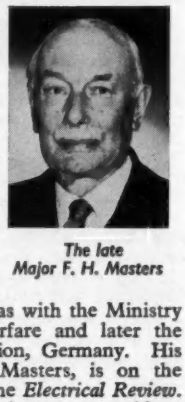
The thirty-first annual sports of the **Indian Cable Co., Ltd.,** were held on the company's recreation ground at Tatanagar, Bihar, India, on 12th January. The finals of track and field events took place in brilliant sunshine and were watched by thousands of spectators. After tea had been served the prizes and trophies were presented to the winners by Mrs. E. D. Johnson.

OBITUARY

Mr. F. H. Robinson.—The death occurred on 30th January of Mr. Frederick Henry Robinson, who was well known as a radio journalist; he was fifty-six. Mr. Robinson founded *The Broadcaster* in 1922 and was its editor. In 1929 he was appointed editor of *Electrical Trading* when, as *Electricity,* it was acquired by Odhams Press, Ltd. He subsequently became supervising editor of these and other journals and since the war he had been identified with Odhams' newspapers.

Mr. Robinson was a founder-member and hon. secretary of the Radio Industry Golfing Society and this year's president. He was also hon. social secretary of the Radio Industries Club and he was chairman of the Club in 1956-57. Mr. Robinson leaves a widow and two children. The funeral took place on Wednesday last.

Major F. H. Masters.—We regret to record the death, on 29th January, of Major F. H. Masters, O.B.E.(Mil.), T.D., M.I.E.E.; he was in his seventy-fifth year. Major Masters was educated at St. Paul's School and the Finsbury and Central Technical Colleges, London, and at Heidelberg, Germany. After occupying positions with the Foster Arclight Co., the Central London Railway and at Chatham Dockyard, he joined the staff of the *Electrician* (now the *Electrical Journal*) in 1906 and was subsequently editor from 1919 to 1927. He then went to *Engineering* as a member of that journal's editorial staff; he retired about a year ago. During the 1914-18 war he served in the London Electrical Engineers, R.E.(T.), and in the last war he was with the Ministry of Economic Warfare and later the Control Commission, Germany. His son, Mr. R. F. Masters, is on the editorial staff of the *Electrical Review.* Major Masters leaves a widow, another son and a daughter.



The late Major F. H. Masters

The funeral took place at Enfield Crematorium on Tuesday.

Mr. E. J. Freeman, credit controller of Bylock Electric, Ltd., died on 28th January at the North Middlesex Hospital.

Mr. W. J. Bransom.—The death occurred on 24th January of Mr. William James Bransom, A.M.I.E.E. Born at Dunstable in 1884, Mr. Bransom joined Edmundsons Electricity Corporation in his early 'teens, and received his technical education at Regent Street Polytechnic. In 1920, with the late Messrs. H. J. Read and H. J. Butcher, he founded Read & Partners, Ltd., and he had been

chairman of that firm for the past twenty-five years. Mr. Bransom was responsible for many large installations, amongst which may be mentioned Devonport Dockyard, Shenley Mental Hospital and Colony, and the Locomotive and Carriage Works at Swindon. He was working in his office two days before his death.

Mr. A. E. Hudd.—In his article on "Automatic Train Control" in our issue of 17th January Mr. B. K. Cooper mentioned that the Hudd system of control had been installed on the London, Tilbury and Southend section of the Eastern Region of British Railways. It was on this section that last week's accident, involving a number of deaths, occurred. By a melancholy coincidence the death of Mr. Alfred Ernest Hudd, the inventor of the system, occurred on 31st January, at the age of seventy-five.

Mr. Hudd served his apprenticeship at the Horwich works of the Lancashire and Yorkshire Railway. He became interested in electric traction and played a leading part in the electrification of the Liverpool and Southport line. Afterwards he set up as a consulting engineer, specialising in signalling, and went to America and Australia as consultant to railway companies. On his return he worked on telephone communications and then, in 1933, became a consultant engineer to the Signal Department of the London, Midland and Scottish Railway in connection with the development and improvement of the signalling system on the Fenchurch Street to Shoeburyness line. Mr. Hudd retired in 1940, some years before his system was fully installed.

Mr. W. E. Groves.—The death occurred recently at the age of eighty-nine of Mr. Wellington Ernest Groves, who was mains engineer for forty years with the Birmingham Corporation Electric Supply Department, from which position he retired in 1932. He was for eight years with the Birmingham Electric Supply Co., Ltd., before the undertaking was taken over by the Corporation.

PARLIAMENTARY REPORT

Thermonuclear Power

Mr. Grimond asked the Prime Minister if he would set up machinery to study the long-term implications of "ZETA" and, in particular, its bearing on investment in existing sources of power and methods of co-operation in its development between public and private industry.

Mr. R. A. Butler (Home Secretary and acting Prime Minister) said it would be premature at this stage to set up the machinery suggested. A great deal of research and development, of uncertain duration, remained to be done before controlled thermonuclear reactions could provide an economic source of power.

Mr. Grimond said that this development would certainly take place and it would have important implications on investment in hydro-electric works in Scotland and in the coal industry.

Mr. Butler replied that the Government would certainly be considering possible future developments, but much work had to be done, as Sir John Cockcroft had pointed out, before temperatures necessary for what Mr. Grimond envisaged were produced.

Mr. Gaitskell said there was a feeling of great pride in the discovery made by our scientists. It was especially gratifying that the men actually concerned in the project had received appropriate publicity. "Can the acting Prime Minister assure us that the Government will give the highest priority to further developments in this field?" he asked.

"Yes, I can," replied Mr. Butler. "And I think we all accept that the scientists who have been involved, from Sir John Cockcroft downwards —if I may use that word—including the team to whom publicity was given, are at present ahead of the world in their achievements, and we should be justly proud of them. Sir John Cockcroft has erred perhaps on the side of modesty in naming the number of years in which these developments are likely to yield results, but in view of his great scientific achievements I think we should accept his own words and wish him well for the future."

Unattended Television Transmitter

Sir James Duncan asked the Assistant Postmaster General where the new low-powered unattended transmitter of television programmes was to be sited.

Mr. Thompson said it would be given its field trial at Folkestone, where the new Dover station would not be able to give adequate coverage because its power had to be restricted. Further plans for the use of this apparatus must depend on the results of the trial, and on the rate at which the B.B.C. could undertake further commitments of this kind.

Monorail Link

Replying to Mr. Hunter, the Minister of Transport and Civil Aviation (Mr. Watkinson) said he was studying means of improving communications by road and rail between London Airport and Central London, including monorail systems, and in this connection the Parliamentary Secretary recently inspected the Alweg demonstration length of monorail near Cologne. He hoped to make a statement after he had considered reports now being prepared by the technical experts.

Later, in the debate on the airways corporations, Mr. Watkinson said the standards of safety required for a monorail would be a good deal higher than those in Germany. "We shall also require a bus which can be taken off the monorail and motored round the airport, so that we do not have to build a tunnel underneath the airport." He had to await technical advice, but would be very glad if the advice said that it would work.

Another possibility was the rail link to Victoria, details of which were now before him. That was a very expensive project because it involved a deep tunnel under the airport runways. It would cost about £20 million or not much less. He hoped to make a decision before long.

Compensation Regulations

Mr. Palmer asked when the regulations, required to be made by the Minister of Power, for compensation to members and officials of the Central Electricity Authority and the Area Boards under Section 27 of the Electricity Act, 1957, would be laid before Parliament.

Sir Ian Horobin, Parliamentary Secretary, Ministry of Power, said the drafting of the regulations was well advanced and Lord Mills expected that the draft could be referred to both sides of the industry during February.

The B.I.F.

Mr. Irving said the House would regret that a decision had been taken which meant the end of the British Industries Fair at a time when industry needed a "shop window." One of the reasons given was lack of leadership. When would the Government give such leadership?

Sir David Eccles replied that national leadership in this case meant a large subsidy and, in his opinion, when there were 105 out of 109 trade associations against a Fair it was not much good giving this leadership.

Thermal Insulation of Houses

As a corollary to his Thermal Insulation (Industrial Buildings) Act, Mr. Gerald Nabarro obtained a first reading last week of the Thermal Insulation (Dwellings) Bill. The second reading will be on 28th February.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Information on Insulation

I AM very grateful to Mr. C. G. Garton, of the Electrical Research Association, for his informative letter, published in your issue of 31st January. I am perfectly aware of the excellent work being done by the E.R.A. and the British Standards Institution—in fact I depend largely for my information in this country on these two excellent organisations, and the Electrical Engineering Abstracts, issued by the Institution of Electrical Engineers.

What I did not know, however, was the meagre amount allocated for this important research, and I hope Mr. Garton's last paragraph will be noted by the British electrical and allied industries in their own interests. Furthermore, there should be closer co-operation between the E.R.A. and the electrical journals, so that there is a wider diffusion of the work being done by that excellent organisation. I would also commend that under the directions and guidance of the E.R.A., a co-operative Laboratory in Electrical Insulations might be set up within the British Commonwealth in the tropics to stimulate research in insulations, as the Commonwealth is a wide market for the British products, and I am sure a country like India with unlimited facilities might be greatly interested in any such scheme, to mutual advantage.

Since my letter appeared in your issue of 10th January, it has come to my notice that the American Institute of Electrical Engineers has now appointed five sub-committees on:—(i) Corona and radiation effects on dielectrics; (ii) gaseous dielectrics; (iii) liquid dielectrics; (iv) solid dielectrics; and (v) thermal evaluation of insulating materials, and a new association has been formed in the United States under the name of the Electrical Insulation Materials Association (E.I.M.A.).

Last September I visited Germany to examine the position of insulation industry in that country, and was very much impressed with the resourceful organisation of the Zentralverband der Elektrotechnischen Industrie E.V. spread over the whole country with offices in large cities. I do not know what is the counterpart in this country.

The suggestion which Mr. Garton makes in his last paragraph should bring about better results, and may enable his organisation to diffuse the knowledge more profitably to the industry. Some years ago Professor Willis Jackson, I believe, was responsible for organising a course of lectures on insulations at the Imperial College of Science and Technology. It is not premature, if I may venture to make a suggestion, that a Chair in Insulations might be established in that College with a well-equipped laboratory on the lines of the Massachusetts Institute of Technology, Boston, U.S.A. Will the electrical and allied industries kindly note this suggestion?

London, S.W.19. ARTHUR R. NISSER, D.I.C.

"What Price Co-ordination?"

MAY I reply to Mr. McArthur's letter in your issue of 31st January. I read his article in *Public Service* but as it did not contain any new thoughts and merely repeated certain notions ventilated by people not in a position to know the circumstances it did not seem to call for much notice. I do not know what Mr. McArthur's practical experience is or how long he has been in the gas industry, but it seems to me that he is more concerned with the opinions of a few amateurs than with the knowledge of those experienced men who are at the head of the fuel industries. Perhaps he does not know that the Ridley Committee, set up expressly to report on a national fuel policy, did not favour an integrated fuel service, but recommended that "out of an appropriate framework of prices and tariffs competition between the gas and electricity industries should continue."

Through your pages, however, I should like to ask Mr. McArthur on what grounds he makes the definite statement that the Minister's "unwillingness or inability to control competition has proved costly and inefficient." Being an accountant perhaps he has special information and could tell us how more costly in money and how less efficient in service to the customer, the present autonomy of Area Boards has proved than would have been the case under integration. I shall be very surprised if he is able to produce any figures or evidence to back up his accusation.

Mr. McArthur now flies another borrowed kite and mentions the set-up in France. Why must a certain type of person always take it for granted that because a thing is done in one way by another country, it must necessarily be a better way than the British way? As a matter of fact the service in France is not ideal by any means and, of course, the selling by the nationalised industries over there is certainly not enthusiastic.

Electricity is used in hundreds of ways and these are ever increasing, whereas the uses of gas are limited and output is on the downward slope. Years ago when gas was generally cheaper than electricity, we heard nothing of the desirability of joint undertakings, and while it would be a friendly gesture on our part to help an old rival in its decline, it is doubtful whether the cost involved would be fair to those who have had the foresight to use electricity extensively.

Though the price of electricity and gas has risen in recent years, this is not a measure of inefficiency. Everyone knows, or should know, that it has been the increased price of coal which has bedevilled our costs and no amount of fiddling with services or sales organisation will have any useful effect on the amount our customers will have to pay for our products.

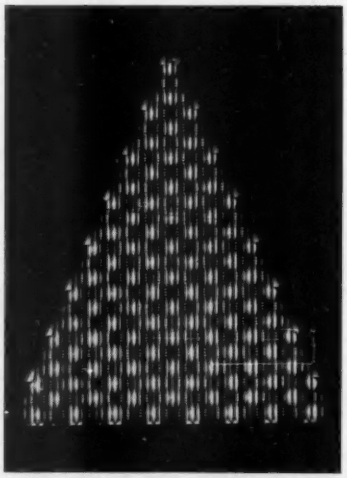
Brighton, Sussex. R. E. GAMLEN.

Electricity in Mines

IN his annual report Mr. J. Davies, Inspector to the Philadelphia and District Mines Inspection Board, Co. Durham, states that while the National Coal Board has undoubtedly made many improvements to mines, the change-over from steam to electricity for winding engines is causing concern. Cases have occurred, he says, of miners having to stay underground for long periods when the power supply has failed, and generally the ventilation system at pits is stopped also. To deal with this situation the Coal Board has provided a mobile winder, but he considers that every pit where all-electric winding engines are installed should also have a standby diesel plant.

PROGRESS AT BRUSSELS

British Electrical and Allied Exhibit Takes Shape



ALL the main structural work having been completed, the British Electrical and Allied Industry Section at the 1958 Brussels Exhibition is now ready for the installation of the many models, items of equipment, and special displays and photographs that will comprise this collective exhibit. The section will occupy a central position in the British Industries Pavilion and about half the area will be built up to a height of over 20ft. This will provide a considerable amount of first-floor accommodation and increase the floor area of the exhibit to 6,500 sq ft.

Along one side there will be three cylindrical Chambers of Energy, each 20ft in diameter, which will depict developments in the generation of electricity from thermal power, nuclear energy and water power. An animated display of a Calder Hall type station, a diorama of a pumped-storage scheme, and an 18ft diameter propeller runner will be among the individual exhibits. Transmission and distribution from the power station to the consumer will be illustrated by a large animated display, and there will also be a single-phase 275 kV oil circuit-breaker, a model of one of the C.E.G.B.'s new control centres, and a display of cables. Among the electric traction exhibits will be 9ft models of the new P. & O. all-electric liner and of a Bristol "Britannia," and a massed display of models of British diesel-electric and electric locomotives in the liveries of the overseas railway companies to which they have been supplied. Examples of fine British workmanship will be included in the section dealing with the dependence of practically all basic industries on electricity for modernisation and efficiency. A prominent feature of the electronics exhibit will be a tower of over 1,000 valves.

The Domestic and Radio Section, which will be reached by two short staircases and take the form of a well-furnished showroom, will include a representative display of over 100 items made by twenty-eight firms. This display will be visible from all over the British Industries Pavilion.

In addition to the emphasis in captions and photographs throughout the exhibit on the part that British engineers and manufacturers have played in overseas development, a special overseas section will illustrate six typical schemes: Owen Falls, the Vancouver undersea power link, the Lisbon-Oporto telephone system, railway electrification in Brazil, a transformer *en route* to the Tennessee Valley Authority, and a mine skip-winder. A three-dimensional map of the world will show the destinations of the £1,000 million value of exports from the industry in the last four years.

Above : Part of the lighting of the exterior of the United Kingdom Government Pavilion at the Brussels Exhibition

One corner of the Electrical and Allied Industry Section will consist of a technical inquiry office block, which will be manned by interpreters and technical staff from the supporting firms. Visitors will be able to read British technical journals and consult electrical reference books. Special publications being prepared for the Exhibition include *Serving the World; Electricity in the Home;* and a guide in six languages describing the exhibit, the 1958 British Electrical Conference, and giving information for buyers wishing to visit factories in this country.

Engineering Exhibits

At a Press conference held last week at the headquarters in London of the Federation of British Industries, Sir Norman Kipping, director-general of the F.B.I., gave some information on the progress made with the British Industries Pavilion at the Exhibition. He made particular reference to the engineering exhibits (as distinct from the display being organised by the British electrical and allied industries) and introduced Mr. Victor Brenner, president of the Birmingham Exchange and Engineering Centre, which is arranging to exhibit the products of 85 of its participating concerns in a two-storey structure to be erected in the Pavilion. Questions on their separate displays were answered by representatives of six other bodies, including Clarke, Chapman & Co., Ltd., British Timken, Ltd., and Renold Chains, Ltd.

Sir Norman Kipping said that the British Industries Pavilion and the Government Pavilion were structurally complete by the end of October. Since then the "finishing" trades had been active and space had been progressively handed over to the display contractors.

Government Pavilion

As we have already mentioned, the main feature of the United Kingdom Government Pavilion at the Exhibition is a triple tower of crystal formation; five panels on the faces of three crystals are to be illuminated. One of these was recently tested at night by the electrical engineers, Troughton & Young, Ltd., with the architects, Messrs. Howard V. Lobb & Partners, in the presence of the Belgian co-ordinating architects and engineers. Each panel is 40ft high and 25ft wide, illuminated by 900 coloured lamps in white, blue and green, so arranged that the whole pattern changes as the visitor moves from side to front view. In the installation, Mersey cables, Simplex switchgear and Atlas lamps were used throughout.

Clean Air Inspection

"Air Pollution News," published by the National Society for Clean Air, Palace Chambers, Bridge Street, London, S.W.1, states that the Minister of Housing and Local Government has decided to make an Order scheduling certain industrial works for control by the Alkali Works Inspectorate, instead of by local authorities under the Clean Air Act, 1956. Among these works are power stations, iron, steel, copper and aluminium works and ceramic works, as well as gas and coke works.

INDUSTRIAL NEWS

Nuclear Science School

The United Kingdom Atomic Energy Authority is to establish a school of nuclear science at Calder Hall, Cumberland, the first of its kind in Britain, it was announced at the annual meeting of the Cumberland Development Council at Whitehaven last week. It will be closely allied to the Whitehaven College of Further Education. The Council chairman, Mr. R. L. Wyllie, said it was hoped that students at Whitehaven College would be enrolled from all parts of the United Kingdom as a preliminary step towards entering Calder Hall.

An Atomic Energy Authority spokesman said that they were willing to help local education authorities by arranging lectures, or even short courses, at Calder Hall. The Authority wished to encourage people who wanted to study atomic energy, particularly on the power production side.

Instrumentation for Danish Reactor

Denmark's new research reactor (D.R.3), to be constructed at Riso, will be equipped with Ekco nuclear instrumentation. This latest-type heavy water moderated research reactor will be the fourth in which Ekco Electronics, Ltd., has been responsible for the manufacture, installation and commissioning of the complete nuclear instrumentation and control circuitry.

Train Pantograph Order

The British Transport Commission has placed a contract with J. Stone & Co. (Deptford), Ltd., for the supply of 500 "Stone-Faiveley" pantographs (overhead electric current pick-up apparatus) to equip the electric multiple-unit trains and locomotives needed for the following British Railways electrification programmes:—London (Fenchurch Street) to Tilbury and Southend; London (Liverpool Street) to Enfield, Chingford, Hertford East and Bishop's Stortford; Glasgow Suburban (North of the Clyde); and Crewe-Manchester.

Fuel Efficiency

The report of the conference on "N.I.F.E.S. Third Progress Survey" held by the Combustion Engineering Association at Harrogate recently is now available. It contains digests of the papers given by Dr. W. A. Macfarlane and Mr. L. Clogg, together with summaries of the discussions. An appendix by Sir Oliver Lyle (Tate & Lyle, Ltd.) deals with the sale of power generated by back pressure sets and the economics of a typical case for small plant. A second appendix, by Mr. Gordon Nonhebel (Imperial Chemical Industries, Ltd.), gives figures of annual achieved efficiencies for over 200 boiler plants. The figures given show how, discounting the increased cost of fuel, steam costs had been maintained at a steady level by continuous modernisation and replacement. The report is available at 21s from the Combustion Engineering Association, 6, Duke Street, St. James's, London, S.W.1.

Electronic Equipment for German Defence

Decca Radar, Ltd., has received a substantial contract amounting to approximately £500,000 for the supply of electronic equipment for the Defence Forces of the Federal Republic of Germany.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £164 0s 0d
Fire Refined 99·70%	ton £163 0s 0d
Fire Refined 99·50%	ton £162 0s 0d
COPPER Tubes ..	lb 1s 7½d
Sheet	ton £196 10s 0d
H.C. wire and strip ..	ton £212 15s 0d
LEAD, English ..	ton £73 5s 0d
Foreign	ton £72 0s 0d
MERCURY	flask £73 0s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £64 5s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 4½d
Sheet	ton —
Wire	lb 2s 2½d
PHOSPHOR BRONZE Wire	lb 3s 4d
PLATINUM	oz £28 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 22½d—22¾d

Kuwait Street Lighting Inquiry

A firm of agents in Kuwait is anxious to get into touch with British manufacturers of street lighting equipment with a view to securing quotations on behalf of the Kuwait Government. We will gladly give the firm's name and address to interested inquirers.

Heating and Ventilating Year Book

We have received the new issue of the Year Book of the Heating and Ventilating Industry, which contains technical, contractual and other trade information for the use of architects, consulting engineers, surveyors and others who come into contact with heating and ventilating engineers. It is published by Technitrade Journals, Ltd., 8, Southampton Row, London, W.C.1, and has been compiled in collaboration with the Association of Heating, Ventilating and Domestic Engineering Employers. The price is 10s 6d net (12s post free).

Batti-Wallahs' Society

There was a large attendance for the first luncheon of the year of the Batti-Wallahs' Society, held on Wednesday last week at the Connaught Rooms, London. Dr. L. G. Brazier (president) was in the chair, and before introducing the guest speaker, Captain A. Northey, D.S.O., R.N., he announced that Mr. R. H. Gummer, a past-president, had been elected an honorary member of the Society. Capt. Northey, who has spent two years in Russia, gave an interesting talk on his impressions of the Russian people and the Russian way of life. A vote of thanks was proposed by Rear-Admiral Sir Philip Clarke.

World Electrical Imports

Against "India," in the table of World Electrical Imports printed on the first inset in last week's issue, the letters W.G. should appear in place of U.K. in the fifth column and U.S. in place of W.G. in the seventh column.

Credit Sale Fraud Case

Officers from the Company Fraud Department of New Scotland Yard discovered that a number of North London housewives were mainly responsible for frauds, involving about £20,000, which arose from credit sales agreements they made with salesmen for electrical and radio traders, it was stated at Wood Green Magistrates' Court on Friday. Eleven women and five men pleaded guilty to a total of 132 charges, including some for aiding and abetting each other. The charges, which all referred to electrical goods, were for obtaining credit by fraud or for causing articles to be delivered by false pretences. The accused also asked the court to take into consideration over 230 further offences. The items obtained, and later sold by the accused, included vacuum cleaners, electric razors, radio sets, sewing machines, steam irons, washing machines, and other household goods.

Mr. Ian Smith, for the Director of Public Prosecutions, said that since April last year the officers investigated 359 cases before making a selection. He explained that under credit sales terms, a buyer paid a deposit and signed an agreement to pay the balance by instalments. The seller delivered the article to the buyer and then forwarded the signed agreement to a finance company who paid him the balance. The buyer was supposed to pay the balance to the finance company, said counsel. In most of these

cases no instalments had been paid. Fictitious names were used and in one case a woman admitted that a guarantee form was signed in the name of her 12-year-old son.

When interviewed by the police and shown the documents, all of the accused made frank statements of admission and said they had sold the articles.

Twelve of the accused were committed in custody to Middlesex Sessions for sentence, two were remanded in custody for two weeks for Borstal reports; one housewife who was concerned in only one charge was placed on probation for two years; and one of the accused men was sent to prison for two years.

Pumps for Kincardine Power Station

The Harland Engineering Co., Ltd., has received an order for motor-driven boiler feed pumps, amounting to over £100,000, from the South of Scotland Electricity Board. The order covers six pump sets serving two 120 MW turbo-alternators at the Kincardine power station. These pumps, driven by 1,650 h.p. high-speed motors, will be the largest of their type installed in Scotland.

E.T.U. Shop Steward Loses Post

Mr. J. Devonside, an electrician employed by the Liverpool Corporation, has been removed from his position as shop steward by the Merseyside Area Committee of the Electrical Trades Union. Mr. Devonside has recently severely criticised the leaders of the Union and has organised a movement to secure a "no-confidence" vote against them.

18,400 kW Germanium Rectifier

A germanium power rectifier rated at 18,400 kW, 80,000 A, 230 V has been installed at the Ellesmere Port plant of the Associated Ethyl Co., Ltd., by the British Thomson-Houston Co., Ltd. The rectifiers will supply d.c. power to two electrolytic cell lines for the production of chlorine, and will comprise two equipments each of four units, each unit being complete with its own transformer and associated switchgear.

The rectifiers are connected in a three-phase bridge circuit with phase-shift transformers to give 48-phase overall operation. The output of each unit is controlled by means of an auto-connected regulating transformer equipped with 17-position on-load tap-changing gear and a trimming regulator to give fine control between tappings. The induction-type trimmer is excited from a tertiary winding of the regulating transformer and feeds back into a series boost transformer connected between the regulating and rectifier transformer primary winding.

The regulating, series booster, and rectifier transformers are combined in one unit. The induction regulators are driven by selsyn receivers controlled from one master selsyn transmitter for each cell line. D.c. transformers are provided to measure the d.c. output from each unit for metering and constant current control. The summated metering signal is compared with a pre-set reference voltage, and the error signal sent through an electronic amplifier to the amplidyne controlling the master selsyn transmitter. When the induction regulators reach the end of their travel, a transformer tap change is initiated and all four units are re-synchronised to ensure that correct load sharing is maintained.

The rectifier unit is divided into three cubicles, each cubicle holding six trays of germanium cells which are connected in a series-parallel arrangement. The overall efficiency of the rectifier, main and regulating transformers, trimmers and phase shifters at normal load exceeds 96 per cent and this high efficiency, together with the compactness of the equipment, gives ample justification for the installation of germanium rectifier equipment.

New Factory for C. A. Parsons

It is announced that C. A. Parsons & Co., Ltd., are to begin work developing a 109 acre factory site at Longbenton, near Newcastle-upon-Tyne. The first instalment will consist of the building of light engineering workshops at a cost of £100,000.

Sir Claude Gibb, chairman of the company, stated that despite the millions of pounds spent on developments at the Heaton and Walkergate Works, Newcastle, the company's facilities were still inadequate to meet present needs. Increased pressure on space was due to the rapid growth in the capacity of generating plant which was the basis of Parsons' operations. About ten years ago the average size of turbo-generators ordered from them was 22 MW and the largest unit was 66 MW. To-day the average size was 150 MW and the largest 300 MW. Sir Claude added that the company had submitted a tender for what would be the largest turbo-generator in the world, at 550 MW.

With the building of the workshops at Longbenton, the space released at the Newcastle works would permit the handling of larger components. Simultaneously with the first stage of the Longbenton scheme, work would begin on a £250,000 heavy shop at Walkergate.

The land at Longbenton was obtained several years ago, but development of the site was postponed about two years ago when Parsons proceeded instead with a £5 million extension at the company's present Newcastle works. The Heaton and Walkergate works now cover 55 acres and employ 7,000 men and women, more than double as many as in 1946.

A.E.I. Birmingham Lighting Exhibition

The latest lighting exhibition opened at the Birmingham showroom (26-28, Holloway Head) of the A.E.I. Lamp and Lighting Co., Ltd., shows a selection of "Mazda" commercial and industrial fittings, including the "Satina" and shop and display ranges. Of special interest is the display of fluorescent fittings wired for individual switching and incorporating a false ceiling. The standard power pack used in all "Mazda" fittings in the "Family" range is shown mounted on a wall panel, in a convenient position to demonstrate the ease with which various diffusers and reflectors can be interchanged. Other exhibits include two suspended space frame displays devoted to shop and display and commercial tungsten fittings and a dummy shop window. By operating the switches controlling the fluorescent lighting and tungsten spot lighting in the window, visitors may obtain different lighting effects. The two showroom windows are devoted to the "Satina" range of satin-etched opal glass pendant fittings and a display of some of the many different lamps available for commercial, industrial and domestic use. These include projector and photo-enlarger lamps, 100/200 W silverlight and pearl lamps and many types of decorative lamps. The annexe of the showroom contains a display of industrial lighting and trunking systems and control gear for fluorescent fittings. The exhibition was designed by Robert Wetmore, M.S.I.A., in conjunction with the

Part of the industrial lighting section of the A.E.I. Lamp & Lighting Co.'s Birmingham exhibition

exhibition and display section of the Publicity Department of the A.E.I. Lamp & Lighting Co.

The company has introduced a colourful new free-standing household lamp dispenser with three tiers of rotatable wire baskets for use in shops and stores. Up to 300 lamps may be displayed in the dispenser which conveniently holds three different wattages of each of three types of "Mazda" g.l.s. lamps. The dispenser stands 5ft 10in high and is made of tubular steel with steel wire baskets, enamelled white. It has a three-coloured silk-screened cardboard canopy which may be crowned by either a "Mazda" lamp, for which a holder and a flex are supplied, or a cut-out card carrying the trade name.

Signal Generators for the Army

Contracts covering f.m./a.m. signal generators for use by the Army have been awarded to Marconi Instruments, Ltd., by the Ministry of Supply. The orders are valued at nearly £70,000, and comprises 117 of type TF 937, and ninety-four of type TF 995A/3/S.

Production of Plastic Mouldings

The Mayor of Swindon (Coun. H. Diment) on 29th January officially opened the new Swindon factory of British Moulded Plastics, Ltd.

Occupying a site of 3½ acres, the new factory provides 81,000 sq ft of productive and warehouse space. The layout of the building and plant has been arranged to permit a smooth continuous production flow. All raw materials are conveyed mechanically up to the first floor, whence they are fed through hoppers or by other mechanical means to the process departments.

Production is at present confined to four main groups—hard rubber, bituminous, battery separators and compression moulding. The basis of the bituminous formulation is hard pitch, which is delivered to the factory in liquid form at a temperature of approximately 400 deg F. The liquid pitch is dispensed to the mixer from a ring main via heated weigh skips. The advantage of this method of operation is that the initial heat of distillation is retained and substantial economies in power consumption are thus effected.

A feature of particular interest is the plant for the manufacture of "Styrex" microporous battery separators, which are produced in a continuous process to a very exacting specification. After passing through the drying oven, the continuous strip is inspected by a photo-electric method with rotating mirrors. This determines the degree of porosity. If this is not within certain limits, the machine sprays red ink on the offending patch; the process does not, therefore have to be halted. The plant is capable of a maximum production of one million separators per week.

The compression moulding plant specialises in the production of small mouldings in all thermo-setting materials, including phenolic, urea and melamine. Mouldings of complex design and of particularly close tolerances are produced in large quantities. A "Wheelabrator" automatic de-flashing machine has been installed which greatly simplifies the finishing of many components. The abrasive used in this machine is coconut fibre.

A fully equipped laboratory undertakes the checking of all raw materials as well as tests on finished products; there are, for example, over fifty routine tests carried out on microporous battery separators. The transfer of the bituminous and hard rubber departments from the company's Walthamstow works to Swindon necessitated the conversion of all the presses from water hydraulics to oil, involving major basic modifications and the complete rebuilding of every press. The oil and other main services for the factory are run in ducts under the floor. Electrical services are run in English Electric roof trunking.

Canada to Supply More Uranium

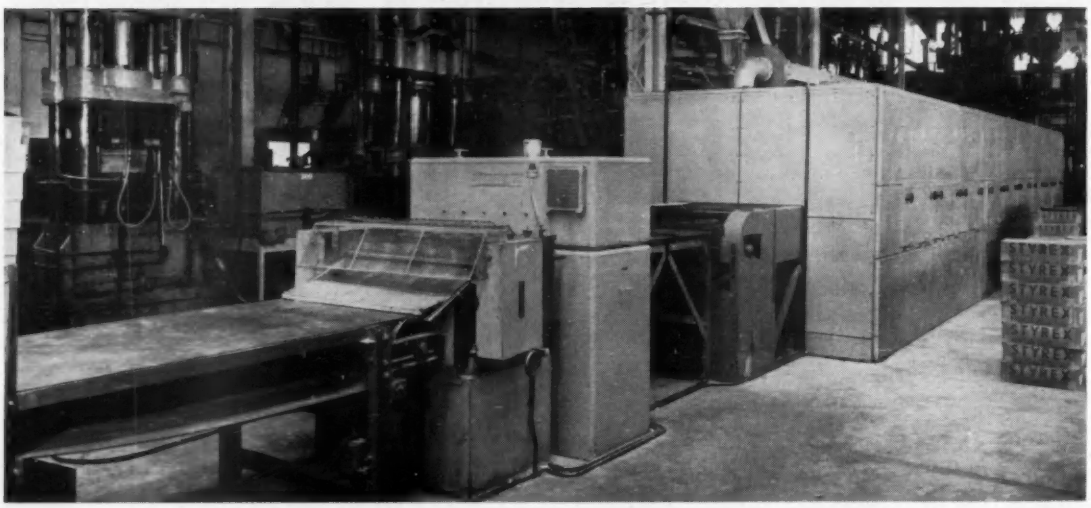
Last year an agreement was arrived at between the Canadian Government and the United Kingdom Atomic Energy Authority by which Canada was to supply uranium valued at $115 million. The Canadian Minister of Trade has now announced the conclusion of an agreement providing for a further supply of uranium to the value of $105 million. This will operate up to March, 1963, and negotiations are in hand to provide for the following period up to the end of 1966.

Carbon Black Production

An extension to their Avonmouth Works has recently been carried out by Philblack, Ltd. This is one of the few factories in Britain producing carbon black from oil by the thermal combustion process, in which liquid hydrocarbons are decomposed by extremely high temperature and the resultant carbon black is collected by means of cyclones and filters. The extension will double the original output of 50,000,000 lb of carbon black per annum.

The original main incoming supply has been superseded by a duplicate 11 kV supply from the South Western Electricity Board, which is controlled through a seven-panel CLA1 Crompton Parkinson metalclad, spring-closed, compound-filled switchboard with a rupturing capacity of 250 MVA. Two of these units feed 6 MVA, 11/6·35 kV ON indoor type transformers with off-

Battery separator production showing the drying oven (right), the photo-electric inspection unit, and the cutting machine (left)



circuit tapping switches, and provide 100 per cent spare capacity to meet the requirements of continuous processing.

The secondary sides of these transformers supply a further eight-panel 6·35 kV 150 MVA CLA1 switchboard. From this board two feeds are taken to the existing substations, while another two feeds supply an additional twelve-panel 6·35 kV, 150 MVA, CLA1 switchboard installed in a new substation which controls supplies to two further 1,500 kVA, 6·35 kV/415 V ON type indoor transformers and for three new h.v. motors of English Electric manufacture. A ten-panel 415 V 30 MVA Crompton Parkinson "Klad" "A" switchboard controls supplies for low-voltage services and for the numerous C.P. motors installed throughout the plant.

The existing substations are sealed to protect all the non-dustproof electrical equipment from the ingress of carbon black, which is an electrical conductor. The main substation has been pressurised for the same reason.

Boiler Plant for South Africa

Mitchell Engineering, Ltd., has been awarded a contract worth nearly £2,500,000 by the Electricity Supply Commission of South Africa for the supply and erection of two 900,000 lb/hr boiler units at the new Komati power station in the Eastern Transvaal. When they go into commercial operation in 1961 they will be the largest capacity and highest pressure boilers in the Union of South Africa.

Scottish Space Heating Exhibition

A "Space Heating by Electricity" Exhibition, organised by the South of Scotland Electricity Board, was opened on Monday last by Sir Patrick Dollan, chairman of the Scottish Fuel Efficiency Committee, at the Scottish Building Centre, 425, Sauchiehall Street, Glasgow. A representative range of appliances is on show including radiators, convectors, fan heaters, oil- and water-filled radiators, heating panels, and temperature control devices. New systems displayed for the first time in Scotland include an electrically-heated door, electrically heated carpet underlays and frost protection for outside staircases. The Board has recently introduced new off-peak tariffs to encourage the development of off-peak loads. The exhibition will remain open for three months.

Generating Sets for Argentina

The National Gas & Oil Engine Co., Ltd., a Brush company in the Hawker Siddeley Group, has received an order for twenty generating sets from the Argentine Government. These consist of diesel engines coupled to alternators and switchgear made by the Brush Electrical Engineering Co., Ltd., Loughborough. They will be largely used to provide emergency power in small townships and will all be delivered this year. Sixteen of these sets will be of the semi-transportable type with the engine, alternator, switchgear, air compressor set, fuel tank and lubricating oil purifier mounted on a skid type underbase. Each of these sets will be capable of developing 554 kW at a speed of 750 r.p.m. The remaining four sets will be of the transportable type, each set being capable of developing 500 kW at a speed of 750 r.p.m.

The new showrooms of Refrigeration (Birmingham), Ltd.

Rhodes-Brydon & Youatt Acquisition

Rhodes, Brydon & Youatt, Ltd., centrifugal pump manufacturers, of Stockport, Ches., have acquired the whole of the issued share capital of Furnival & Co., Ltd., printers' engineers, of Reddish, Stockport. The members of the new board of directors are: Messrs. G. Parkes, C.M.G., J.P. (chairman); N. Youatt, M.I.Mech.E. (deputy chairman); H. R. Thompson; W. Latta; J. Johnson; R. L. Furnival; and F. Furnival. It is intended to continue to operate Furnival & Co., Ltd., as printers' engineers.

Brighter Homes Exhibition

The 1958 *Daily Mail* Brighter Homes Exhibition will be held at the City Hall, Manchester, from 11th to 29th March.

New Refrigeration Showrooms

Refrigeration (Birmingham), Ltd., Prestcold distributors for the Central Midlands, have opened new showrooms recently in Birmingham.

Situated near the centre of the city, the new showrooms are close to the meat and food markets. Five large front windows together with two other windows and double doors ensure a maximum display of refrigeration products, whilst the contemporary interior with its concealed fluorescent lighting and spotlights all combine to make it pleasant for the prospective customer. The showroom is constructed on two floors with a total area of some 2,200 sq ft, which enables a complete range of refrigeration equipment to be displayed. A frozen food fair will be held there from 25th to 27th February.

Price Reductions

Gent & Co., Ltd., announces a reduction in price of some of its domestic bells.

The price of the "Briticent" full load earth continuity tester of the British Central Electrical Co., Ltd., has been reduced.

With effect from 1st February, the list prices of the MK products of M.K. Electric, Ltd., have been reduced. A new price list (HCP393) is available.

Sunbeam Electric, Ltd., has reduced the prices of its frypan-cooker, and of the glass and metal covers.

Calendar

The calendar (March, 1958-February, 1959) sent us by the Parolle Electrical Plant Co., Ltd., has large sheets showing two months on a sheet, each of which has a picture in colour of a typical scene in the north.

Trade Announcements

Modern Electric (Installations), Ltd., has moved to 66-68, Brewery Road, King's Cross, London, N.7 (telephone: North 6688). The new factory has an area of 12,000 sq ft and will be devoted entirely to the manufacture of neon signs.

Mr. J. Barlow has been appointed manager of the depot for **"Servis" Washing Machines** (Wilkins & Mitchell, Ltd.), at 1047-9, Argyle Street, Glasgow.

Mr. R. Sosbe has been appointed representative in Lancashire, Cheshire and North Wales of **James Gordon & Co., Ltd.** Mr. Sosbe has been with the company for six years, first as a member of the outside technical staff and later in the projects department.

MANUFACTURING PROGRESS IN 1957

General Electric Co., Ltd.

TURBO-ALTERNATORS made by the General Electric Co., Ltd., commissioned during 1957, included three 60 MW and two 30 MW sets for the Central Electricity Authority and two 30 MW sets for the Kelvin station of the Johannesburg City Council. At Hams Hall "C," where the first set was installed in 1956, five 60 MW machines are now in service. A further 120 MW reheat set has been ordered for Northfleet and, overseas, a contract has been placed for two 60 MW sets for the new Kelvin "B" station.

In connection with the Ravenscraig iron and steel works project of Colvilles, Ltd., the company undertook a comprehensive contract covering the complete power station, including civil engineering work. Four gas-fired boilers, three turbo-generators and two turbo-blowers were completed on the scheduled programme and commissioned early in 1957, just over two years after commencement on an undeveloped site.

Turbo-Alternator Developments

An automatic voltage regulator of the magnetic amplifier type, which dispenses with the need for a pilot exciter, has been developed for use with large turbo-alternators where a high degree of accuracy and high speed of response are required. The first of this type, for one of the 60 MW turbo-alternators to be installed at Poole, has been completed, and further orders are in hand.

Five 60 MW turbo-alternators at Hams Hall "C" station

A further development, associated with turbo-alternators having outputs of 200 MW and above, is the water cooling of stator windings. While not conferring such a marked advantage as direct hydrogen cooling of the rotor, this method does enable the weight of a wound rotor for units in excess of 200 MW to be kept within the maximum permissible transport weight of about 160 tons.

Several large orders for heavy metalclad gear were received during the year, including one for a hundred 33 kV, 750 MVA units for the British Railways (Southern Region) East Kent electrification; an 11-unit switchboard rated at 33 kV, 750 MVA for the Steel Sales Company of Africa; and a 9-unit board rated at 11 kV, 750 MVA for Bloemfontein, South Africa.

During the year, large transformers totalling over 770 MVA were completed, over three-quarters of this total being for the Central Electricity Authority, including four 72 MVA generator transformers for Hams Hall "C" and two 60 MVA and three 45 MVA transformers for outdoor substations at Bridgwater, Alton and Chesterfield. Overseas orders completed include a 22·5/30 MVA, 132/72 kV, 60 c/s auto-transformer for the Saskatchewan Power Corporation, Canada. Grain-oriented steel is used for the core and a tap-changing switch on the high-voltage winding covers a voltage range of +5 to −20 per cent in 21 steps. Cooling fans, which are automatically controlled by switches in the temperature indicating apparatus, are mounted underneath the cooling radiators to provide the additional cooling required for the higher rating of 30 MVA. A second transformer of similar design, but rated at 30/40 MVA, is now being built for this customer.

A new design of liquid-cooled, single-anode mercury-arc rectifier has been developed for service in multiple-unit rolling stock and locomotives for the British Railways 25 kV, single-phase electrification scheme. An outstanding feature of this equipment is its very small size. Investigations are also being made of the performance of these rectifiers on industrial loads, and a 350 kW, 440 V, six-phase equipment has been installed in the works power house at Witton for this purpose.

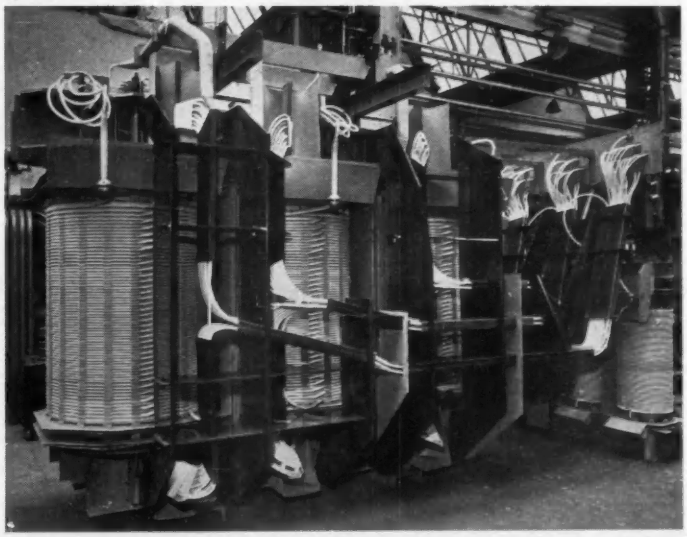
Handling Large Structural Sections

Throughout the year there has been a good demand for circular lifting magnets, over 50 per cent of which are for overseas, the principal markets being Canada and India. The problem of lifting rolled steel sections, including 60ft lengths of broad-flanged beams measuring 36in by 16½in and weighing over 14,000 lb, was solved by an arrangement of bi-polar magnets with extended poles, this construction permitting the poles to be lowered on to the main web of the beam between the side flanges so that a safe lift is ensured. Four units of this type, each weighing over 2,000 lb, are suspended from a spreader beam for handling these long structural sections.

The Mount Isa Mines winder is the largest electric winder ever to be installed at an Australian mine. It is a 16ft diameter by 6ft double-drum double-clutched winder driven through single reduction gearing by two 2,250 h.p., d.c. motors, and is designed to deliver 180,000 tons of ore from mine to mill each 28-day period, this

being an increase of almost 80,000 tons over the present shaft capacity. Automatic push-button control from twelve levels is a feature of this installation. A four-rope Koepe winder, one of the largest of its type, was installed during 1957 at the Driefontein gold mine near Johannesburg. It is capable of raising a skip load of 14 short tons from a depth of 5,460ft. All the electrical equipment was made at Witton and includes two 2,050 h.p., d.c. motors, and a 3,800 h.p. Ward-Leonard set operating in conjunction with control exciters.

For the Indian Government's new steelworks at Durgapur, near Calcutta, the Materials Handling Department of the Fraser & Chalmers Engineering Works has received orders for the complete ore handling and blending plant, which is designed for dealing with limestone, dolomite, and miscellaneous materials. Large contracts in hand at Witton for the same project include electrical equipment for a 16-stand merchant mill driven by individual d.c. motors from 150 to 800 h.p., amounting in the aggregate to 8,000 h.p., and supplied through grid-controlled mercury-arc rectifiers.



22·5/30 MVA, 132/72 kV auto-transformer for the Saskatchewan Power Corporation showing method of supporting tapping leads

Orders were received during the year for electrical equipments for 71 multiple-unit trains to operate on the 25 kV, single-phase system adopted by British Railways, and for ten four-axle electric locomotives of 3,300 h.p. The G.E.C. is supplying the diesel-electric power equipments for the five high-speed Pullman trains which are to be placed in service on the London-Bristol, London-Birmingham-Wolverhampton, and London-Manchester routes.

An order has been received for a further 28 electrical equipments for 1,000 h.p. main-line locomotives being built by the North British Locomotive Co., Ltd., for British Railways, and another repeat order brings to a total of 100 the number of power equipments supplied or on order for British Railways standard 350 h.p. diesel-electric shunters.

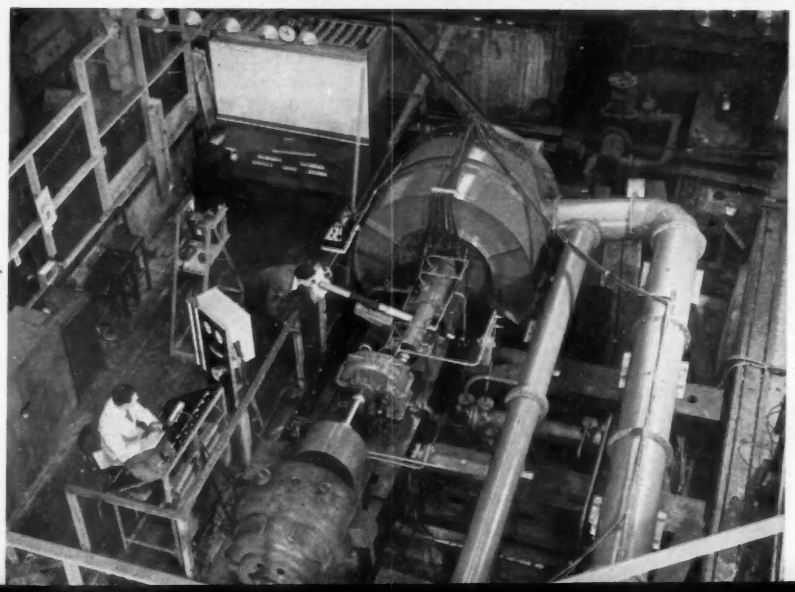
Contracts have been received by the Siemens and General Electric Railway Signal Co., Ltd., for signalling modifications necessitated by the forthcoming high-voltage a.c. electrification in the Colchester-Clacton-Walton area, and for similar work at Liverpool Street, Fenchurch Street and the Shenfield to Chelmsford and Southend-on-Sea lines at present operated at 1,500 V d.c. which are to be converted to a.c.

An order was placed with the G.E.C. during the year by Empresa Municipal de Transportes de Madrid for 25 equipments to convert existing oil-engine buses to trolley-bus operation.

Nuclear Power

Construction of the 360 MW nuclear power station at Hunterston was begun as soon as possible after final approval of the site had been obtained by the South of Scotland Electricity Board. In parallel with the development of the present type of nuclear power station, work is now being carried out on a new project, the high-temperature gas-cooled reactor. The company has been awarded a contract by the United Kingdom Atomic Energy Authority for a large part of the design and construction of a zero-energy assembly for this reactor, which will be used primarily for the investigation of the nuclear properties of the design without the complications of heat output and radiation intensity. The high-temperature gas-cooled reactor is a thermal breeder type, operating on the uranium 233/thorium cycle, that is, fission is primarily due to slow neutrons and more atoms of fissile uranium 233 are produced than are consumed. The basic fuel is thorium.

One-third scale model of a gas circulator for the coolant of a nuclear reactor



The company is making

electronic registers for trunk dialling at the Bristol exchange, which will be the first exchange in the United Kingdom with this facility. This installation will form the first large-scale use of the CCT6 cold-cathode triode developed by the company specifically for such applications.

The range of modern high-frequency generators has been extended by the introduction of an 8 kW dielectric heater and an 18 kW induction heater. A generator with an output of 25 kW has been installed at Nottingham University and a smaller unit of 7 kW output, provided with a melting furnace table, has been supplied to King's College, London. A recent development by the company in high-frequency heating is the use of a cable to take the output from the set to the work position or hand-held coil.

The contract to supply a new floodlighting system for Niagara Falls was awarded to a Canadian associate company of the G.E.C., the Amalgamated Electric Corporation, Ltd. The equipment being supplied comprises 20 specially designed, weatherproof, high-intensity carbon arc projectors incorporating remotely-controlled automatic colour-change devices and wide beam arrangements to provide a large range of dramatic lighting effects. The new projectors will be supplied under sub-contract by Savage & Parsons, Ltd., of Watford.

Dock Electrification

Installations in the Port of London

IN a lecture delivered at the Institution of Electrical Engineers to the Association of Supervising Electrical Engineers on 30th January, Mr. M. Rundle described the electrical installations in the large dock areas of the Port of London Authority. These docks, he said, cover about 4,000 acres, of which 700 acres are water. The maximum demand in 1957 was 20,750 kW (9,600 kW a.c.) and the consumption of energy reached 44 million kWh (compared with 10 million in 1917, 25 million in 1938 and 31 million in 1948) which is supplied from the public high-voltage mains. Electricity was first introduced in 1880 at the Royal Albert Dock for lighting by Siemens arc lamps, and in 1894 a few hand-operated travelling cranes were converted. King George V Dock, opened in 1921, was the first of the P.L.A. group to be designed to use electric power on a large scale.

The bulk of the power for the group continues to be distributed as d.c. at 480 V in view of the quantity of plant and cables on that system which have many more years of useful life. Conversion from a.c. is at present by mercury-arc rectifiers situated at load centres, but the development of semi-conductor rectifiers for individual plant items is being watched.

The 11 kV a.c. primary distribution system is usually a ring main, operated either open or closed depending upon the form of 415 V network and on the protective methods adopted. Low-loss transformers of 500 kVA are normally installed. Oil or air circuit-breakers control the 415 V distributors which are generally interconnected through links at pillars, whence services and sub-mains are supplied through cartridge fuses, though very large services are supplied at medium or high voltage direct from circuit-breakers in the substations. Protective relays are normally of the inverse definite minimum-time earth-fault and over-current type.

Quay Cranes

The most important item of machinery for cargo handling in British ports is the quay crane and three-quarters of the 600 installed in the P.L.A. docks are electrically driven. The 3-ton level-luffing d.c. crane largely used, has an outreach of 65 to 80ft, a hoisting speed of 240 ft/min and a luffing speed of 120 ft/min. The fastest safe handling speeds are automatically pre-selected over the extreme range of loads, giving a smoothness of power supply that increases brush and commutator life and reduces maintenance. For a.c. quay cranes the rotor resistance of two slip-ring motors is varied by contactors while hoisting and lowering. Electrical maintenance is expected to be much less than with d.c. The higher operating speed is also expected to produce substantial economies.

Electric vehicles cost less to operate and maintain than diesel or petrol units but they are usually slower and it is difficult, particularly with fork-lift trucks, to obtain a full day's work without recharging the battery. A great advantage they possess in closed warehouses is the elimination of dirty exhaust gases. Lead-acid batteries for the 1 to 2 ton fork-lift trucks have 14 cells giving 360 Ah or 560 Ah at the 5-hr rate. The most commonly used electric vehicle is the 2 ton platform truck (150 are in service) moving at 5 m.p.h. Electric tractors for towing trailers loaded up to 5 tons are also employed. There are 20 canteen vehicles with 72 V 224 Ah batteries, which travel at 12 m.p.h., covering 30 miles between charges and requiring little maintenance.

Pumping Plant

For restoring dock-water level lost through movement of ships, impounding pumps are run for an hour or two before and after each high tide. An impounding station may have three 5·5 million gal/hr pumps (one as standby) driven by 350 h.p. high-voltage motors with direct-on-line starting. Similar equipment is used for de-watering dry docks in conjunction with small motors, automatically controlled by float switches, to deal with seepage water.

About one-third of the total maximum demand is accounted for by lighting, in general by filament lamps (20,000 are renewed each year) in view of the low intensities generally required and the limited time of their use. Fluorescent lamps are being introduced in offices and machinery houses where higher intensities are required or where night work is common. Improvements in the standard of lighting in old buildings presents the greatest difficulty. For external illumination, often for 3,000 to 4,000 hours a year, colour-corrected mercury fluorescent 250 or 400 W lamps are preferred. For temporary lighting on board ships when cargo is being worked, and for portable tools, double-wound transformers, having 110 V secondaries with centre points earthed, are being installed.

In 1952 the P.L.A. decided to set up its own private radio-telephone system for conducting port operations. This has since been expanded to cover its use by various P.L.A. vessels and by shore-based police and ambulance services.

Board's Responsibility for "Leakage" Currents

SUCCESSFUL DEFENCE IN DEVON CASE

By G. O. McLEAN, M.Eng., A.M.I.E.E.

A RATHER brief report in the national Press and the B.B.C. news bulletins on 14th January of the judgment delivered by Mr. Justice Ashworth in the Queen's Bench Division the previous day in an action for damages brought by a farm labourer against his employer and the South Western Electricity Board, does not give any indication of the importance of the case to the whole of the supply industry. Further details of the claims against the Board, which were dismissed with costs by the learned judge, should be of considerable interest to other Area Boards.

Rick-Building Under 11 kV Line

On the face of it, this accident would appear to have been a straightforward case of carelessness on the part of a Devon farmer and insufficient control of a horse by one of his labourers, but the allegations made against the Board were far from straightforward. Briefly, the undisputed facts relating to the accident which occurred in June, 1953, were that the farmer, Mr. L. Dymond, was completing a hay rick under an 11 kV overhead line, with a hay hoist consisting of a tubular steel mast and jib supported on a wooden base. The hay was lifted by means of a grab, which was connected by a steel wire running over pulleys at the end of the jib and the top and bottom of the upright mast to a two-wheeled rake to which a horse was harnessed. The horse was led forwards and backwards over a distance of 18 to 20ft and the grab moved in response to the horse's movements. The jib head was several feet clear of the overhead line, which was, in fact, the main distribution feeder from Tavistock to Lifton, and was controlled by oil circuit-breakers at each end.

After a period of rick building, it was found that the throw of the jib over the rick was not wide enough, necessitating too much handling by the men on the top of the rick. The hoist position and the height of the jib were therefore adjusted so that the clearance between the jib and conductor was reduced to about 2ft, the conductor-ground clearance being about 24ft. With the hoist in the new position, only one grab load was attempted, and as the horse went too far and too fast in its forward movements, the grab was forced against the pulley sheave end of the jib and forced the latter into contact with the 11 kV line. The horse was killed and the labourer leading it by the bridle received a shock.

Farm Labourer's Serious Injuries

After an unsuccessful attempt by Mr. Dymond to unshackle the hoist wire from the rake as he received a shock and had to be dragged clear, the plaintiff, Mr. R. H. Lawrence, who was wearing rubber boots, succeeded in doing the disconnecting. Unfortunately, the weight on the grab full of hay was too great for Lawrence, and he was pulled off his feet on to his left shoulder, while still keeping hold of the end of the hoist wire. As soon as his shoulder and arm touched the earth, current passed to earth causing shock and serious burns. Despite some very skilled work over a period of a year by a Bristol surgeon, favourably commented on by the learned judge, Lawrence lost the whole of his arm, shoulder blade and collar bone.

Almost simultaneously with Lawrence being pulled to the ground, the wire came into contact with a steel crowbar or spike used for securing the hoist to the ground. The arc resulting from contact between the live wire and the metal spike severed the hoist wire and set fire to the loose straw and the hay rick. The linesman foreman of the Electricity Board, who lived in the village, was informed and he telephoned the branch manager before going to the scene of the accident. The foreman noticed that the line was still alive and the jib of the hoist still making contact with it, but no human beings were in contact or in the danger zone. Having left the police constable in charge, with a request to keep everyone clear, the foreman proceeded to meet his manager who was on the way to the scene by car, and to have the line switched out. The Board's officers proceeded eight miles to the nearest switching point at Tavistock, saw that there was 80 A out-of-balance on this lightly loaded 0·1 sq in feeder, and proceeded to isolate the section affected, after arranging for alternative supplies to the other sections of the system—then receiving supplies from this feeder. Altogether these proceedings took 70 minutes from the time that the Board's foreman first received word of an accident to the time when the section of line was isolated and earthed.

Claim Against Board

The claim against the Electricity Board was based on allegations of breach of statutory duty of Regulation 13 of the 1937 Supply Regulations; breach of duty required under Regulations 4 and 17 of the Overhead Line Regulations (ELC53 (1947 revise)) and finally negligence at common law in not expeditiously making the line dead after the first accident when the horse was killed. In the development of the claim, the plaintiff's counsel, through examination of expert witnesses, attempted to prove that excess energy mentioned in Regulation 13, being energy in excess of that required by consumers, was in effect "any leakage" and therefore any leakage such as 80 A out-of-balance noticed by the officers of the Board when they went to switch off should have been automatically disconnected according to Regulation 13. It was suggested that one method of doing this was by means of earth leakage relays.

With regard to Overhead Line Regulation 4, it was argued that "normal use by the occupier of farm land" included the building of hay ricks on that land and therefore the height of the line conductors should have been increased to 30 or 35ft so as to allow for a hay rick to be built. Hay ricks had been built in this part of the field by the farmer's predecessor but not by the farmer, since the line had been built, because it had been ploughed up during the war and the wayleave agreement between the farmer and the Board was on the basis of the land being arable.

On the question of common law negligence, it was argued that the Board had a duty to the public, and especially those landowners who granted wayleaves to

the Board, to keep a continual check on the occurrence of any leakage currents and to ensure that the lines were switched out as soon as leakages occurred. It was suggested that any delay exceeding 5 or 10 minutes was negligence and the 70 minutes in this case was gross negligence.

Board's Defence

Counsel for the Electricity Board in his opening speech stressed that this case contained matters of great importance to the whole country and not only to his clients, as the points at issue had never been considered in any court before. He felt that the allegations against the Board were essentially an attack on the Board's methods in carrying out its statutory obligations. The plaintiff's technical advisers had already decided that the Board had failed in these obligations, but it was most important for the court to realise that the Electricity Board's "masters," the Ministry of Power, whose duty it was to ensure that the Regulations were not broken, had not taken any proceedings against the Board as a result of this accident and so far as it was known from correspondence between the Board and the Ministry when the accident was reported to them, the latter were quite satisfied that the Board was carrying out the Regulations correctly.

It was also necessary to stress that the Board was not privileged to do things with electrical energy that other people could not do (except sell the energy publicly); it was, in fact, very strictly controlled by the Regulations. One of the Board's obligations was to give a supply of electricity to anybody in its area, subject to certain conditions, and the Board could be penalised for not doing so. This should be remembered when witnesses stressed the importance of continuity of supply, and discriminative protection. He referred again to the fact that the Ministry had not intimated any difference of opinion to the Board on the interpretation of the Regulations. Though the Regulations were made in virtue of the powers conferred under an Act of Parliament, he suggested that the Court could only interpret the meaning of the Regulations if there was any doubt about the meaning, such as a difference of opinion between the Ministry who were trying to enforce them and an Electricity Board which was endeavouring to comply with them.

On the question of common law negligence, he felt sure, from his experience, that the Court would agree with him that if there were two genuine schools of thought (and more often than not experts on either side in Court cases differed) then the adoption of one idea by the Board in preference to another did not constitute negligence or even lack of thought. He pointed out that the allegation of the Board's neglect to read meters to discover leakages could obviously only lead to an absurdity as it meant all meters, at all times of the day and night, which could only mean multiplying the number of staff literally by thousands. It was also bordering on absurdity to advocate steps to be taken to stop a leakage if it were known, when in fact it was not leakage which caused this particular accident, but a diversion of electrical energy (due to human error) causing an electrical circuit to be made between the Board's live conductor and earth.

The Regulations themselves told the Board what precautions it should take to prevent occupiers of any premises or land being exposed to danger—namely, that "the line conductors shall be rendered inaccessible without the use of a ladder or other special appliance." He suggested that the inaccessibility precaution was wholly adequate.

Expert witnesses called by the defence maintained that the Board did comply with Regulation 13 because it had provided automatic circuit-breakers to operate when the current on this particular feeder exceeded 240 A, whereas a safe working load for a conservative temperature rise was 255 A, according to the Electrical Research Association's Report (O/T5) relating to the carrying capacity of bare copper conductors. Subsequent tests had shown that the breaker and protection equipment performed satisfactorily at the settings existing at the time of the accident. It was also maintained in relation to an allegation that the Board had contravened Overhead Line Regulation No. 17, which relates to the "provision to prevent danger" in the event of a conductor falling, that the Regulations were drawn up by engineers, for the use of engineers, and that engineers accepted the second part of Regulation 17 to be advice from the former Electricity Commissioners on what would be considered "adequate means." This was abundantly clear from Regulation 18 which dealt with road crossings.

All accidents caused by the fouling of overhead high-voltage lines in the Board's area during the 12 months preceding this accident were described in detail by one of the witnesses. It was clear from these records that the form of protection, e.g. earth leakage or plain overcurrent, had not in any way affected the severity of an accident or the damage caused to personnel in the danger zone. Stress was also laid on the need for protection settings on main lines to be such that discrimination was obtained with other protective devices behind and in front of the section concerned, as well as the simple forms of protection such as fuses on spur lines off the main line. Evidence was also given that lines were regularly patrolled and any dangerous practices, such as the building of hay ricks under lines, were pointed out to consumers and occupiers, as well as careful attention being given to danger notices, anti-climbing devices and all safety precautions. By implication, the judge accepted the views of the Electricity Board, as he dismissed all allegations regarding breach of Regulations and negligence under common law.

The plaintiff was awarded damages of £8,711 against Mr. Dymond. The judge granted a stay of execution for 28 days pending consideration of an appeal but ordered that Mr. Lawrence should be paid £2,000 immediately.

Measurement of Geothermal Steam

IN the North Island of New Zealand there are numerous thermal areas in which bores have been drilled in an attempt to harness the emerging steam for the generation of electricity. This steam, however, contains a great deal of water and the present methods of measuring the mass output generally require heavy and bulky equipment.

To overcome this disadvantage a method using flow nozzles is described in a paper by Messrs. R. E. Belin and A. E. Banbridge, which has been submitted for written discussion to the Institution of Mechanical Engineers. This method enables the density of a small column of steam-water mixture to be estimated by measuring the absorption of beta rays in it, a single reading only being required to determine the dryness fraction. If the upstream pressure at the entry of the nozzle containing the column is measured the mass output can also be calculated from an equation similar in form to the single-phase mass-discharge equation derived from Bernoulli's principle.

A relation, it has been found, exists between the dryness fraction and the density, while the latter, in conjunction with the upstream pressure, enables the mass discharge to be calculated. From these two results and the steam and water enthalpy at the pressure of operation it is possible to estimate the total heat output.

Industrial Gas Turbine

Unit Operating on Blast Furnace Gas

A 2,500 kW gas turbo-alternator set has just been completed by Richardsons Westgarth (Hartlepool), Ltd., for Shelton Iron & Steel, Ltd. This machine is designed to utilise blast furnace gas or oil fuel and is the first gas turbine to be installed by the steel industry in this country. The gas turbine has been manufactured to the designs of Brown, Boveri & Co., of Baden, Switzerland.

Since obtaining the order for the Shelton gas turbine the company has increased its contribution to the exports of this country by obtaining two further orders, each for two units, from British Brown Boveri for the Kuwait Oil Co. and from the Pakistan Industrial Development Corporation. The Kuwait units will have a terminal output of 7,500 kW at an ambient temperature of 50 deg C and a maximum output of 10,500 kW at 30 deg C and those for installation in Pakistan will have a terminal output of 5,700 kW at an ambient temperature of 40 deg C. All units will operate normally with natural gas fuel.

To cope with the increased volume of business in the land turbine field, Richardsons Westgarth have in hand a development programme involving expenditure of £1,750,000 for the extension of their manufacturing, erection and testing facilities for turbines and alternators. These extensions, which will be completed by the end of this year, will enable the company to manufacture and handle the largest turbo-alternator sets now envisaged.

The Shelton gas turbine is of the single-shaft open-cycle type with regenerators and the operating cycle is illustrated in the accompanying diagram. Air is drawn from the atmosphere and compressed in a 14-stage axial compressor running at 5,350 r.p.m. and then passes to two heat exchangers in parallel. Each of the heat exchangers is a mild steel vessel containing about 4,200 tubes and the air flows across these tubes picking up heat from the exhaust gases of the turbine flowing through the tubes.

From the heat exchangers the air passes to a combustion chamber of the vertical all-metallic type. Here, part of the air is used to burn the fuel admitted to the combustion chamber and the excess air which is not necessary to maintain combustion is used to cool the combustion gases before they reach the gas turbine. The combustion chamber is situated relatively near the turbine and the combustion gases pass to the turbine through a double-walled duct. This double-wall effect is continued in the inlet branch of the turbine right up to the first row of blades. The turbine is of the six-stage pure reaction type and the combustion gases after expanding through the turbine pass, as previously mentioned, through the tubes of the heat exchangers to atmosphere.

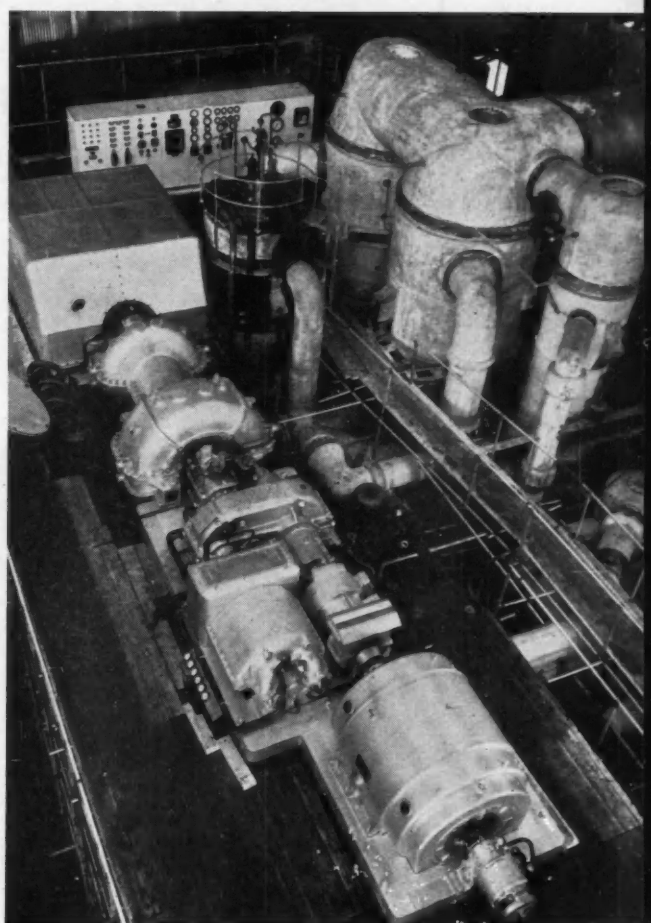
When this machine is installed at the steelworks the fuel normally employed will be blast furnace gas. This fuel will be available at a pressure slightly above atmospheric and as it has a low calorific value it is necessary to employ a relatively large quantity of gas. For this reason a six-stage centrifugal type compressor is employed to raise the gas to a pressure higher than the air pressure in the combustion chamber. This gas compressor is driven at 7,970 r.p.m. through speed increasing gears from the main turbine and compressor shafts.

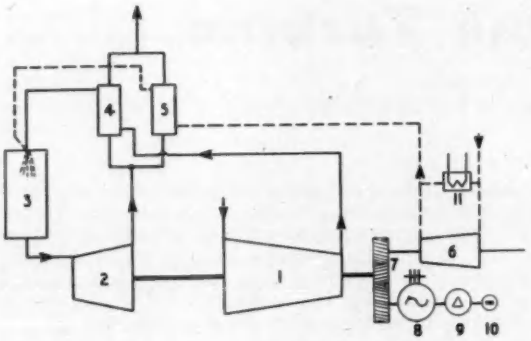
A large proportion of the power produced by the turbine is absorbed by the air and gas compressors to which it is coupled. The excess power is available as net output at the terminals of the alternator which is driven through reduction gearing from the main turbine and compressor shafts. For control purposes and also to guard against the possibility of surging, the gas compressor is provided with a recirculation branch and a cooler is installed in this branch. Before admission to the combustion chamber the blast furnace gas is heated in a small heat exchanger which is similar in design and construction to the larger air heat exchangers.

For starting-up purposes an electric motor is provided which can raise the speed to approximately one-third of the normal operating rate. This motor is not disconnected mechanically when the set is in operation but the brushes are lifted automatically when a self-sustaining speed is reached.

The output of the set at a given ambient air temperature

General view of 2,500 kW gas turbo-alternator set under test at the Richardsons Westgarth works





Cycle diagram of gas turbine with blast furnace gas firing

1. Air Compressor. 2. Gas Turbine. 3. Combustion Chamber. 4. Heat Exchanger for Air. 5. Heat Exchanger for Gas. 6. Blast Furnace Gas Compressor. 7. Gear. 8. Generator. 9. Starting Motor. 10. Exciter. 11. Gas Cooler. ——— Air. - - - - Blast Furnace Gas

and at constant speed is solely a function of the gas temperature at the turbine inlet. The output of the set is, therefore, controlled by varying the gas temperature, i.e., by regulating the fuel quantity admitted to the combustion chamber. It is the prime function of the governing system to control the fuel quantity in accordance with load requirements at all times. To achieve this the set is equipped with a speed governor of the spring-loaded centrifugal type which is driven from the end of the main driving wheel on the reduction gearing. This governor controls the pressure in the governing oil system and this pressure, in turn, controls the opening of the regulating organs by means of which fuel is admitted to the combustion chamber. The governing oil pressure is not only influenced by the speed governor but can at any time also be controlled manually by means of a starting valve which provides, in parallel with the speed governor, a drain opening for the governing oil. Although this set will normally run on blast furnace gas a special feature is that it can also operate on a mixture of blast furnace gas and gas oil and, if essential, on gas oil alone. In the event of a temporary shortage of blast furnace gas a separate gas oil burner can be inserted in the combustion chamber simply by operating a magnetic valve. Automatic starting of the fuel injection pump follows and admission of gas oil to the combustion chamber is initiated by a hand-operated valve. When operating on a mixture of blast furnace gas and gas oil the quantities of fuel admitted to the combustion chamber are controlled by the hydraulic governing system.

Alarms and trips are fitted to guard against high gas temperature at the turbine inlet, low pressure in the blast furnace gas main, loss of lubricating oil, overspeed of the units and other irregularities. To simplify the starting-up procedure the whole operation can be carried out from the control panel by means of programming switches.

AUSTRALIAN NEWS

From a Correspondent

ONE of the most spectacular developments in New South Wales this year will be the construction by the Electricity Commission of a 330 kV transmission line from Yass to the Snowy Mountains. This line will link the main N.S.W. supply system, largely served by steam power stations, with the first of the Snowy Mountains hydro-electric stations on the Tumut. The 90-mile line will cross the Dividing Range near Kiandra and must be built to withstand severe blizzard conditions of ice, snow and high winds. Specially strengthened steel towers, and extra heavy conductors, will be used on the high altitude sections.

The line will terminate near Cabramurra at the Snowy Mountains switching station, to which power will be brought from the underground generators. The contractors, the Electric Power Transmission Company, will string the most difficult part of the line next summer, and complete it in time to receive the first power from the Tumut in the winter of 1959 for distribution in New South Wales.

Construction work will begin early this year on a major new substation at Penrith to help meet the increased demand for electricity in the outer western area of Sydney. The substation will cost about £500,000 and is expected to be commissioned early in 1959. At the same time the steel tower transmission line to Lawson will be extended to the new Wallerawang power station and a further section of line will be built from Penrith to link with the hydro-electric plant being installed for the Commission at Warragamba dam.

New South Wales industrialists complain that electricity costs them 20 per cent more than in Victoria, and that this is one of the principal reasons for Victoria's industrial boom at the expense of N.S.W. Power charges in N.S.W. are roughly double those in Great Britain.

With the exception of 1953 (when import cuts were first applied), sales of electrical goods in Australia have shown a steady increase since 1949; in that year the total value was £33·8 million compared with £113·5 million last year.

Sir Arthur Warner, managing director of Lugon Electric Lamps, Pty., Ltd., a subsidiary of Electronic Industries, Ltd., claimed recently that the Australian Tariff Board had failed to protect Australian industry. "The necessity for import licensing," said Sir Arthur, "is a measure of the inadequacy of our tariff system. Import licensing is a bad, inefficient system of controlling trade. It operates on a Star Chamber method and is capable of abuses, including pressure of various types. It is better to give increased tariff protection as a means of at least reducing the import licensing problem."

Fourteen companies from nine countries, including Great Britain, the United States, France, Germany, Italy, Japan, Sweden and Holland, have submitted tenders for the construction of the planned coaxial cable between Sydney and Melbourne. Examination of the tenders is expected to take some time.

BOOKS RECEIVED

The Ultra High Frequency Performance of Receiving Valves. By W. E. Benham, B.Sc., F.Inst.P., and I. A. Harris, A.M.I.E.E., A.M.Brit.I.R.E. Pp. 173; figs. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 28s.

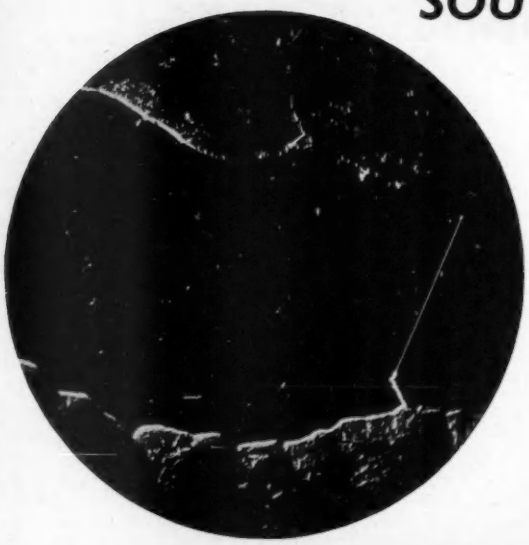
Industrial Television. By H. A. McGhee. Pp. 120; figs. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 15s.

Pressure Measurement in Vacuum Systems. By J. H. Leck, M.Eng., A.M.I.E.E., A.Inst.P. Pp. 144; figs. Published on behalf of the Institute of Physics by Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 30s.

Industrial Electronics. By Andrew W. Kramer. Pp. 311; figs. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 36s.

SOUTHAMPTON SHIPPING CONTROL SYSTEM

Minister of Transport Inaugurates New Service



THE Southampton Harbour Board's new Port Operation and Information Service was inaugurated last month by the Minister of Transport (Mr. Harold Watkinson). The Information Service provides a continuous indication of the movements and positions of all vessels navigating within the port area and its approaches, and relevant information can then be passed by radio-telephone to individual vessels. The Service is provided by a Decca Type 32 radar system and Marconi v.h.f. radio-telephone communication equipment, in Calshot signal station.

The v.h.f. radio equipment has been chosen to conform to the recommendations of the International Maritime V.H.F. Conference held at The Hague in January, 1957. Although Southampton is the first harbour to be equipped with this system, shipowners who install the shipboard equipment will do so knowing that this system will be used internationally.

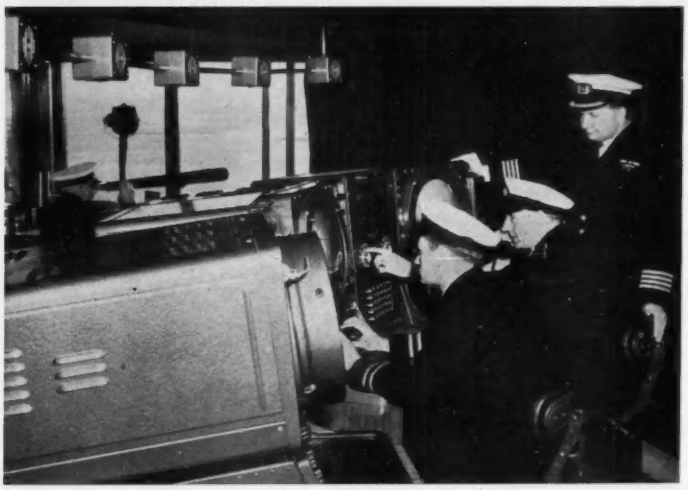
At Southampton it was decided that initially four port operations channels, in addition to the calling and safety channel (156·8 Mc/s), should be provided, but the system allows for ample future extension. All these closely spaced channels can be operated simultaneously and the system provides coverage over an area extending from the docks to approximately twenty miles along the East and West Solent.

The type of equipment installed in the transmitting and receiving stations is a version of the Marconi HX/HR 80 Series fixed station v.h.f. transmitter/receiver, using 80ft masts with ground-plane folded unipole type aerials. Local or remote switching facilities for up to six channels are provided. The transmitter produces the maximum effective radiated power output permitted of 25 W. Crystal control is used, the six crystals of both transmitter and receiver being contained in a thermostatically controlled oven, affording a frequency stability of 0·0005 per cent. The radio control panel incorporates dialling facilities for automatic selection of the channels on any of the five transmitter/receiver equipments and is fitted into the radar control console. At both the transmitting and receiving stations generating plant is installed which comes into operation automatically in the event of a mains failure.

To provide continuous monitoring of speech channels so that manual logging of messages at peak periods is unnecessary, an automatic tape recording unit, made by Thermionic Products, Ltd., has been installed. It is designed to operate on seven channels and is capable of being extended to record 14 channels. Another channel is used to record a coded time signal produced by a master clock, which is an integral part of the recording equipment. The exact time of any occurrence can therefore be accurately established.

The radar aerial, on Calshot Tower, is situated at the entrance to Southampton Water, and has a range of approximately 18 miles.

The Decca Type 32 is a 3 cm, very high definition equipment, using an aerial of 25ft span. For reliability and to ensure continuous operation during routine maintenance, there are two entirely separate radar channels with remote control change-over switching facilities. Any one of five predetermined display areas which, together, make up the planned coverage of the station, can be selected on any of the three separate displays. The display units themselves are of the 15in diameter Decca fixed coil type, and are fitted with a novel electronic system for measuring range and bearing with high accuracy. Known as an "Interscan," this is a form of auxiliary trace which is variable in range, bearing and origin. Appearing as a continuously painting electronic line, the "Interscan" is an accurate method of making measurements between any two points on the face of the radar display. Particularly in harbour radar, this operational facility is of importance because ships nearly always need their position with reference to the nearest navigational mark rather than to the radar station itself.



Above: Radar display of Eastern Solent showing Ryde in the bottom right-hand corner

Right: Operations centre at Calshot signal station

Reactor Computations

Examination of Temperature Transients : Digital Computer Applications

FOUR papers were presented on Tuesday before the Measurement Section of the Institution of Electrical Engineers in conjunction with the British Nuclear Energy Conference.

In the first paper Messrs. J. H. Bowen (U.K.A.E.A. Industrial Group) and E. F. O. Masters (Preece, Cardew & Rider, attached to the Industrial Group) gave the results of an examination, by means of an analogue computer and a graphical method employing an approximate solution of neutron-kinetic equations, of the possible temperature transients in gas-cooled thermal nuclear reactors of the Calder Hall type.

The main transients considered arose from: step changes in reactivity; steady changes in reactivity; step changes in cooling; steady and other changes in cooling due to circulator speed and gas pressure. Pressure gradients within the fuel elements, fission-product heating and heat generated in the graphite moderator were also taken into account with the effects of non-uniformity in the axial and radial temperature distribution throughout the reactor.

Since faults in reactors have been extremely rare, confirmation of predicted results by experiments on actual reactors was regarded as desirable. The temperature of the fuel-element sheath (a critical factor) should be as high as possible, for thermodynamic reasons, but a limit was set by fault possibilities. If this limit were exceeded, mechanical failure of the sheath and release of fission products to the coolant gas would occur, followed by slow oxidation of uranium. Although the fission products would be contained within their envelope, the internal contamination of the reactor might be severe.

Proportional and Fission Counters

The authors of the other papers are all with the U.K.A.E.A. (Harwell). Two papers by Messrs. W. Abson, P. G. Salmon and S. Pyrah described the design, manufacture and operating characteristics of boron trifluoride proportional counters and the design, performance and use of fission counters.

In the former case one basic design and method of assembly is used for counters ranging from ½in diameter and a few inches long to 2in diameter and several feet long. Consistently good electrical characteristics, the authors stated, could be obtained in large-scale production of instruments for the measurement of neutron flux in the thermal and epithermal energy range. Medium-sized counters could discriminate between neutrons and gamma radiations at gamma dose rates of 100 to 200 rads/h. The characteristics of the counters that had been outgassed at 400 deg C showed no significant deterioration after running at up to 100 deg C for three months. At 150 deg C, however, a change was observable after three weeks owing probably to dissociation of BF_3 and to the giving off of electron-capturing impurities from the counter walls. A typical medium-sized counter (e.g. 1in by 6in) could be used for 10^{11} counts at a gas multiplication factor of 10.

In a companion paper, the applications of fission counters were stated to be measurement of fission cross-sections, analysis of neutron spectra and relative measurement of neutron flux (e.g. in reactor power level instrumentation). Data were given concerning the effect of thickness of fissile material on sensitivity and the effect of electrode spacing and gas pressure on pulse height. They showed that high detection efficiencies were obtainable with electrode coatings of 1 mg/cm^2, which could be doubled to give high sensitivities. With argon gas filling, the product of gas pressure and electrode spacing should lie in the region of 0·4 to 1. The operating level of the discriminator was usually determined by the effect of alpha activity in the fissile material, typically corresponding to 5 to 20 MeV particle energy. For neutron-flux monitoring U235 was almost invariably used, as it gave maximum sensitivity and low alpha activity for a given weight of coating material. Although the boron-trifluoride counter achieved a much higher thermal-neutron sensitivity, its discrimination against a high level of gamma radiation was far less effective, which often made the fission counter the only detector suitable for low-level power control in small reactors and in high temperatures. Absence of deterioration in characteristics comparable with those observed with BF_3 counters gave the fission counter a longer life, e.g. $1{\cdot}5\times10^{12}$ counts, without any change.

Computers and Reactor Design

The application of digital computers to nuclear reactor design was dealt with by Dr. J. Howlett, who considered the main computing problems involved in connection with electric power stations. The first decision, he pointed out, would be based on very broad economic and scientific grounds on the type of reactor to be built and the electrical output required. Thus to provide 100 MW of electrical energy would require about 400 MW of heat. For a natural or slightly enriched uranium thermal reactor (as was most likely to be used for several years to come), the fuel rating would be about 4 MW/ton and the charge would therefore be about 100 tons. The moderating ratio would have to lie between 1 : 1 and 5 : 1, making the total weight of moderator between 100 and 500 tons. Engineering and metallurgical considerations would determine a range for working temperature, and the power required for pumping and possible corrosion effects would decide questions of the circulation of the coolant. The aim of the subsequent main calculations would be to find the dependence of the critical mass of the core on the moderating ratio, enrichment of fuel, temperature and dimensions within the limits of the preceding general arguments. Subsequent calculations would give the flux distribution and hence the fission rate (which determined the power level) and the conversion factor for the build-up of fuels, such as plutonium 239 or uranium 233, if relevant. Further calculations were then needed to give the response to movements of the control elements, particularly when starting up or shutting down, and the possibilities of dangerous surges in power or temperature. Long-term changes in reactivity due to accumulation of fission-product poisons, fuel breeding and burn-up of the fuel charge also called for investigation for working out a fuel-cycling schedule. Worthwhile economies were obtainable by avoiding unnecessary shielding. Because the various types of calculations were very different mathematically a fast general purpose computer would be needed.

GENERATION AND DEVELOPMENT

Swedish Contract for Cross-Channel Cable Equipment

It is announced that the Swedish ASEA company has been awarded a contract worth about £1 million to provide terminal equipment for the d.c. cross-Channel power cable linking the British and French electricity systems. The terminal points will be built at Dungeness and Boulogne and work is expected to begin soon. An official of the Central Electricity Generating Board said last week that the contract had been awarded to the Swedish company as no British company was yet able to manufacture the necessary equipment.

Overhead Line Inquiry

An inquiry has been held at Caldbeck (Cumberland) into an application by the North Western Electricity Board to construct an overhead line from Caldbeck to the transmitting station at Sandale Fell. Cumberland County Council, the Lake District Planning Board, the Council for the Preservation of Rural England, and the National Parks Commission said that the cable should be underground. The plan for the use of an overhead line was supported by the National Farmers' Union. The Electricity Board stated that it was proposed to carry the line on 28ft wooden poles and the cost would be about £6,750.

Electricity Supply 1947-57

In our issue of 29th November we gave an account of the twenty-sixth meeting of the National Joint Advisory Council for the Electricity Supply Industry, the last to be held before the change of organisation of the industry. The Council has now published in booklet form a verbatim report of the statements made at the meeting, under the title "Electricity Supply 1947-57; Achievements and Prospects." It includes a review by Lord Citrine of the ninth report and accounts of the Central Electricity Authority and discussion on the report; statements on the future of the industry by Sir Henry Self and Sir Christopher Hinton; and tributes paid to Lord Citrine.

Service Centre Competition

Last Friday Mr. A. N. Irens, chairman of the South Western Electricity Board, presented the Board's Challenge Cup to Penzance Service Centre, winners of the competition for the brightest and most attractive window display in a small service centre in the West Country. Bodmin Service Centre, which took second place, also received an award.

Mr. Irens told the winning teams that good window display was vital to selling policy. Since 1948 sales of electricity in the West Country had nearly doubled, and 100,000 electric cookers and nearly 100,000 water heaters had been sold by the Board.

South Western Consultative Council

The South Western Electricity Board has invested over £5 million since 1952 in reinforcing and improving the Board's system in the West Country. This was stated at a recent meeting in Exeter of the Electricity Consultative Council, when a report was received for adoption from the Council's Tariff Committee following a meeting with Mr. A. N. Irens, chairman of the Board.

In the discussion before the Tariff Committee, Mr. Irens had emphasised that security of supply was of paramount importance and the Board was doing everything possible to improve the system within the limits of capital available.

Change-over at Darlington

At a meeting of the North Eastern Electricity Consultative Council at Newcastle-on-Tyne it was reported that estimates were being prepared for converting the electricity supply in part of the Darlington area from d.c. to a.c. It was stated that the cost was likely to be about £50,000 and, owing to restrictions on capital expenditure, it was not expected that the work would be put in hand for some time.

OVERSEAS

Russian Aid Sought by Ceylon

The Government of Ceylon has asked the Soviet Government for assistance in the construction of hydro-electric projects and high-voltage transmission lines. The details of the projects were discussed with a Russian trade and economic delegation which visited Ceylon to negotiate a trade and economic agreement between the two countries.

New Era in Christchurch

From time to time during the past decade power shortages in New Zealand have made it necessary to restrict electricity consumption in varying degrees. In 1956-57 the position became acute and, as the chairman of the Christchurch Electricity Committee records in the undertaking's latest annual report, consumers were required to conserve power to the "almost impossible" figure of 60 per cent of normal requirements. The response, he says, was "embarrassingly successful" and the loss to the Department very severe. Now that power has become available from the Roxburgh scheme the position has radically changed and the undertaking proposes to embark upon an aggressive sales campaign to retrieve its losses.

The report of the engineer-manager, Mr. G. H. Battersby, B.Sc., M.I.E.E., shows that during the year under review sales were reduced by nearly 16 million kWh, to 300 million kWh, the brunt of the cut being borne by domestic consumers. Revenue declined by £34,121 to £1,261,040 and there was an adverse balance of £71,828.

Reference is made in the report to the Government's plans for merging gas and electricity undertakings as authorised by the Electricity and Gas Co-ordination Act, 1956. It is stated that, in essence, the Government wishes to withdraw the 20 per cent subsidy on gas sales and place the onus of keeping the gas industry financially sound on electricity consumers. This proposal is naturally not welcomed by the electricity undertaking.

Another matter of interest is the progress of the undertaking's scheme for the use of ripple control equipment to reduce the peak load. By March last year 15,474 relays for water heating control had been installed.

On amenity grounds, the Council has decided to replace overhead lines in the centre of the city by underground cable.

Johannesburg Tramways Abandonment

The last tramcar will disappear from the streets of Johannesburg towards the end of 1960—some 54 years after the first tramway was opened for public service. This results from the municipality's £2½ million plan for conversion to diesel and trolley-buses.

Street Lighting Notes

The Minister of Housing and Local Government sanctioned loans to local authorities totalling £744,182 for public lighting during the quarter ended 31st December last.

Bridgwater (Somerset) Corporation is recommended to approve in principle a scheme, estimated to cost £9,400, for the improvement of lighting in various roads during 1958-59.

Chislehurst and Sidcup U.D.C. has approved proposed expenditure of £25,000 during 1958-59 on improvements to existing street lighting.

Colne Corporation is recommended to approve a scheme for the conversion of the street lighting in Bridge Street and Greenfield Road from gas to electricity.

Nelson Corporation is recommended to make application to borrow £10,750 for electric street lighting.

Improvements to **Shrewsbury's** street lighting, estimated to cost £10,000 in the coming financial year, are recommended. The work includes conversion from gas to electric lighting.

NEW ELECTRICAL EQUIPMENT

Silicon Rectifiers

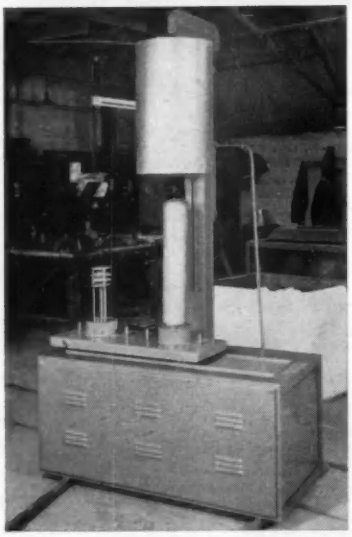
Additions to the 0·5 A and 1 A ranges of "SenTerCel" silicon junction rectifiers are announced by STANDARD TELEPHONES & CABLES, LTD., Rectifier Division, Edinburgh Way, Harlow, Essex. A 400 V (peak inverse voltage) device, type RS25A, has been added to the range of 0·5 A silicon rectifiers available from production and three rectifiers, types RS33A, RS34A and RS35A, with peak inverse voltages of 200 V, 300 V and 400 V respectively, have been added to the 1 A range.

Hydrogen Bell Furnace

A hydrogen bell furnace supplied by ROYCE ELECTRIC FURNACES, LTD., Sir Richard's Bridge, Walton-on-Thames, Surrey, has a work space of 5in diameter by 13in high and is suitable for operation at temperatures up to 1,000 deg C. Heating elements of 80/20 nickel chromium surround the heating chamber, giving a uniform heat transfer throughout. For operation with protective atmospheres, heat-resisting steel gas-tight retorts are provided, complete with sealing rings to engage in the base. Gas is introduced through the base to purge oxygen from the work chamber.

Two identical bases are mounted upon a traversing trolley. The charge to be treated is stacked upon the base and the gas-tight retort placed in position. When the chamber is purged of oxygen the heated bell furnace is lowered over the retort. During the heating cycle, the second base may be loaded up and purged. The bell, retaining its sensible heat, is then lowered over the second retort whilst the first charge is allowed to cool in the protective atmosphere. Larger bell furnaces, with chamber sizes up to 3ft diameter by 5ft high, can be supplied for operation at temperatures up to 1,150 deg C in protective atmospheres.

Royce hydrogen bell furnace

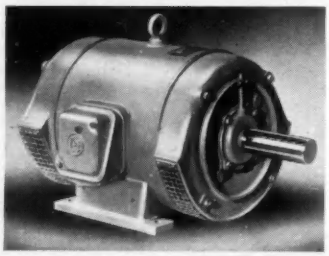


Squirrel Cage Motors

A range of ventilated, squirrel-cage motors complying with draft specification CX(ELE)5976, a revision of CW(ELE)6246 for dimensions and B.S. 2613 for electrical performance with Class "E" insulation, is announced by LAURENCE, SCOTT & ELECTROMOTORS, LTD., Gothic Works, Norwich.

At present only standard squirrel-cage motors are offered and popular ratings are available from stock. It is intended, however, to develop "Trislot" high-torque low-current squirrel-cage motors in the same frames. As a result of the use of the most modern insulating materials, the incorporation of a highly efficient cooling system, and the rating of the machines for 65 deg C rise with Class "E" insulation, these machines offer reductions in size, weight and price over previous standards.

The motors embody the L.S.E. "steel frame" construction, the body design is smooth and easily cleaned, and the enclosure affords a high degree of protection. The terminal box may be rotated to permit cable entry from any one of four positions and, if desired, the position of the terminal box (normally on the right-hand side of the body as viewed facing the non-driving end) may be changed by reversal of the frame.



L.S.E. ventilated squirrel-cage motor

Smoke Control Equipment

Two new units to measure smoke density are announced by PHOTO-ELECTRONICS (M.O.M.), LTD., Fotron Works, 63a, Kingston Road, London, S.W.19.

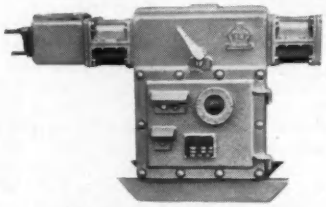
They are suitable for chimneys up to 10ft in diameter, and comply with B.S. 2740 : 1956. The type PCSA unit throws a beam of light across the chimney on to a photo-electric cell receiver. As the smoke breaks the light beam, a varying current is emitted by the cell and amplified by the printed circuit control unit. When the smoke has reduced the current emitted by the cell to a point set by the operator, a relay closes and an alarm is given. Price £39 10s per set.

The type PCSI unit complies with B.S. 2788 : 1957, and is suitable for chimneys up to 40ft in diameter. Operating on the same principle as the PCSA the variation of current emitted by the photocell is shown on a 10in scale meter calibrated in percentage obscuration. Visual and audible alarms are also incorporated and a variety of recorders can be supplied to give a permanent record of combustion conditions. Price £84 10s per set.

New Industrial Starter

The "Nelbest" type DDOF/30 starter has been designed by W. & H. NELSON, LTD., Nelbest Works, Mossend, Bellshill, Lanarkshire, to meet the requirements of the small horse-power squirrel cage motor used in the mining, chemical and oil industries. It is of robust construction and compact, with maximum accessibility of internal equipment.

The top chamber consists of a triple pole isolating switch mounted on straight-through busbars and the end connecting plates are manufactured to National Coal Board specification. The incoming cable boxes can be arranged for sealing chambers and trifurcating boxes or any of the "flit plus" systems. The contactor is hinge mounted on the back of the door and can be fitted with magnetic or thermal type overloads with single-phase protection. The h.r.c. fuses are easily accessible when the front cover is open. The switch can be arranged for remote control operation with low voltage transformer and fitted with an ammeter if required.



"Nelbest" DDOF/30 starter

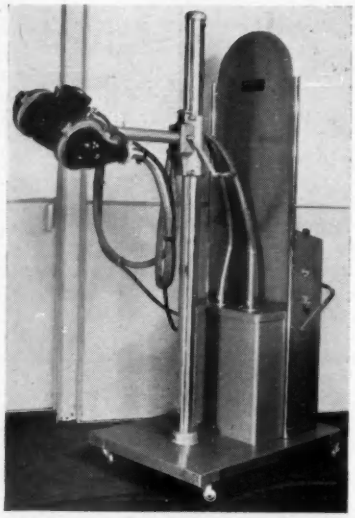
The complete unit has been certified for Groups 1 and 2 gases. The case dimensions are 25½in high by 20in wide by 20¾in deep. The cable boxes are extra to these dimensions.

Industrial X-ray Equipment

The Type TF 1597 industrial X-ray equipment announced by MARCONI

INSTRUMENTS, LTD., St. Albans, is an 110 kV peak apparatus, designed for 200-250 V a.c. operation, and basically consists of three portable units: h.t. generator, control unit and tubehead.

The 110 kV peak generator is oil-immersed in a welded-steel tank. It comprises the h.t. transformer and an X-ray tube filament transformer.



Marconi Type TF 1597 X-ray equipment on castored base

Two 62·5 kV peak cable sockets provide the output to the X-ray tube, while the input from the control unit is taken to terminals at one end of the tank. The control unit is housed in a rectangular case with a sloping panel on which are mounted all controls and meters. A synchronous motor-operated self-resetting timer is incorporated, with a wide selection of ranges.

The X-ray insert tube normally supplied can be operated at up to 110 kV peak 10 mA, and provision is made for water cooling at the higher ratings, circulation being derived from the normal tap supply. Three standard tubehead mountings are available.

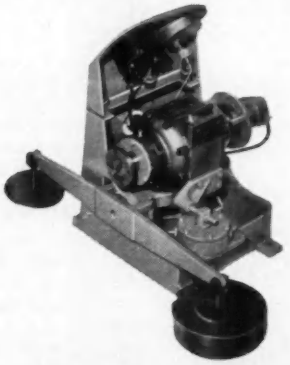
New Dynamometer

The standard type of Froude hydraulic dynamometer measures torque with an inaccuracy at full load of less than a quarter of 1 per cent. Some users do not require such performance and HEENAN & FROUDE, LTD., Shrub Hill Road, Worcester, have introduced a new design, known as the I.E. brake or dynamometer. This consists of a brake unit, on general Froude principles, without torque-measuring equipment when only a simple power-absorbing unit is required. It can be converted into a full-scale dynamometer by mounting it on a pivoted platform and fitting a lever arm for measuring the torque-reaction forces.

The power-absorbing elements of the brake (rotor and stator) are of the single-sided type instead of double-sided. The resulting axial thrust is self-contained, and is amply within the capacity of the brake bearings. The load at any particular speed depends upon the quantity of water discharged into the brake casing by a pump impeller mounted on the brake shaft. This quantity is regulated by a hand valve fitted to the casing and control is very stable and convenient.

These two features, of single-sided power elements and the above control gear, permit a greatly simplified and economical construction. The brake unit on its pivoted platform is provided with a short lever arm, bearing upon a pressure capsule, coupled by small-bore piping to a pressure gauge calibrated to give torque readings. At full torque the accuracy is within ±1 per cent.

The torque dial is supplied with 20ft of small-bore piping, so that users can fit it remotely from the dynamometer if they wish; the tachometer is of the electric type, and extended wiring to such a remote station will not affect its accuracy. A device can be supplied for quickly checking the accuracy of torque readings. This consists of a quick-fixing lever arm and dead-weights; as weights are added one by one, the torque dial readings should, of course, follow consistently. Three sizes of brake and dynamometer are at present available, ranging from 25 h.p. at 4,600/6,000 r.p.m. to 100 h.p. at 2,500/4,000 r.p.m.



Heenan & Froude I.E. dynamometer

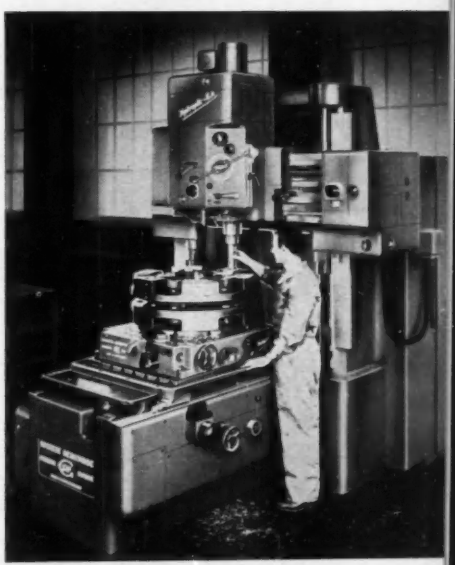
Jig Borer

A NEW high precision jig borer and milling machine has been introduced by Société Genevoise, Ltd., Newport Pagnell, Bucks. Described as the "Hydroptic-6A," it can be supplied with a new automatic photo-electric co-ordinate repeating device, the electronic control equipment for which is fitted with magnetic drum "memories." The accuracy of the repetition is within 0·00004in (0·001 mm). This device gives 15 to 30 per cent higher production rates than that of the earlier "Hydroptic-6" machine according to the type of work involved. Even without this new device productive capacity of the new machine is 8 to 10 per cent higher than its predecessor.

Drilling, boring and milling capacity is increased without reducing accuracy and the spindle motor in the "Hydroptic-6A" is on the side of the spindle head instead of at the top as in the previous machine. The spindle head is equipped with a device for the preselection of spindle speeds by means of a circular slide rule. Once the cutting speed has been chosen the corresponding spindle speed is obtained by setting the knob on the prescribed boring diameter. When the machine is in action, the operator can select the speed for the next operation and thereafter the speed is changed by pushing a single lever.

The clamping and unclamping of the tools in the spindle is performed automatically. When the tool is introduced into the taper the clamping is done by a motor. When unclamping it is sufficient to push a button. In each case the operator has both hands free to handle the tool. The spindle saddle is provided with a powerful, rapid traverse. There are, moreover, 4 transversal milling feeds in each direction and the locking of the cross-rail and its powered vertical movement are hydraulically controlled by a single lever. The electrical equipment is contained in a metal cabinet fixed on to the machine, all parts being easily accessible and well protected.

"Hydroptic-6A" milling machine and jig borer



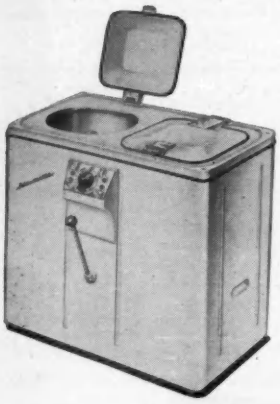
DOMESTIC ELECTRICAL EQUIPMENT — Spin and Tumbler Dryers

CENTRIFUGES and hydro-extractors have been in use in laundries in this country for many years but their domestic counterpart, the spin dryer, is a relatively new addition to the range of home laundry appliances available to the British housewife. There are now almost a dozen different designs from which to choose. Up to a few years ago, when the first models were imported from the Continent, such equipment was not available in this country. The spin dryer makes it possible for the whole laundry process to be carried out in a continuous series of operations and, of course, there is no need to wait for the right drying weather.

Approximately four minutes is considered by most manufacturers to be adequate to damp-dry a load of washing ready for ironing. In brief, this drying action is achieved by placing the wet washing into a perforated drum, which is spun at a high speed (average 2,000/2,500 r.p.m.) and the pressure created between the walls of the drum and the clothes, squeezes out the water. It therefore differs from the tumbler dryer, in which the air is drawn over a heating element by a fan and circulated through the clothes in a drum revolving at a much lower speed (approximately 45/50 r.p.m.).

In addition to the free standing models, spin dryers have been combined with washing machines in a single unit, and both washing and drying can be carried out simultaneously. The latest model in this field is the "Ada-matic," and just recently Hoover, Ltd., have announced that an unheated version of the "Hoovermatic" is now available.

Manufacturer or Distributor	Name or Model	Type	Size (H. W. & D. in.inches)	Clothes Capacity (dry weight)	Heater Loading and/or Motor Rating	Drum Speed	Exterior Finish
ADA (HALIFAX), LTD., Johnson Street, Halifax.	"Adamatic"	Combined washing machine and spin dryer	33×28×18	5 lb	Heater: 3 kW Motor: ½ h.p.	2,700 r.p.m.	Cream or white stoved enamel
BRATTEL ELECTRIC CO., LTD., 27, Old Bond Street, London, W.1.	"Thermair"	Spin	26×15 diameter	6/7 lb	Heater: 1 kW Motor: ½ h.p.	1,425 r.p.m.	White stoved enamel
	"Saturn"	Spin	12×14 diameter	5½ lb	Motor: ½ h.p.	1,450 r.p.m.	White stoved enamel, red band and base
BURCO, LTD., Rose Grove, Burnley, Lancs.	"Tumblair"	Tumbler	36×21×20	5 lb	Heater: 1 kW (low) 2 kW (high) Motor: ½ h.p.	52/54 r.p.m.	White/blue, white/maroon, cream/blue or cream/maroon
CHILTON ELECTRIC PRODUCTS, LTD., Hungerford, Berks.	"Chilton"	Spin	24½×11⅞ diameter	4 lb	Motor: ½ h.p.	2,400 r.p.m.	White stoved enamel, red band, gold trim
CREDA (SIMPLEX ELECTRIC CO., LTD.), Creda Works, Blythe Bridge, Staffs.	"Debonair"	Spin	28½×15½×15½	6 lb	Motor: ½ h.p.	2,800 r.p.m.	White or cream stoved enamel
CROWN APPLIANCES, LTD., 18, Gipsy Hill, London, S.E.19.	"Sentinel-Brocke"	Spin	23½×14 diameter	5/6 lb	Motor: ½ h.p.	2,900 r.p.m.	Lacquered and chromium plated
EASICLENE PORCELAIN-ENAMEL (1933), LTD., Lord Street, Wolverhampton.	"Easiclene"	Spin	28×16×16	7 lb	Motor: $\frac{1}{10}$ h.p.	1,500 r.p.m.	Stove enamelled, range of colours
EDY (GREAT BRITAIN), LTD., Farnley Low Mills, Whitehall Road, Leeds, 12.	"Edy" C2(M)	Spin	28×13½ diameter	7 lb	Motor: ½ h.p.	1,500 r.p.m.	White vitreous enamel
	"Edy" C3(M)	Spin	28×13½ diameter	7 lb	Motor: ½ h.p.	1,500 r.p.m.	White vitreous enamel
	"Edy Super-Twin"	Combined washing machine and spin dryer	32½×36×21	8/9 lb	Heater: 2 kW Motor: ½ h.p.	1,460 r.p.m.	White vitreous enamel
ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2.	4600 and 4601	Tumbler	36×26½×24½	8/9 lb	Heater: 2,750 W (4600) or 4 kW (4601) Motor: ½ h.p.	48 r.p.m.	White or cream stoved enamel, aquamarine, lavender or candy pink top
HOOVER, LTD., Perivale, Greenford, Middlesex.	"Hoovermatic" 3174 (heated) and 3444 (unheated)	Combined washing machine and spin dryer	31⅛×29½×17	6 lb	Heater: 3 kW Motor: ½ h.p.	2,000 r.p.m.	White stoved enamel, grey stoved enamel aluminium lid, blue base



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1. *"Ada-matic" combined washing machine and spin dryer*
2. *"Brocke-Sentinel" spin dryer (Crown Appliances)*
3. *"Thermair" heated spin dryer (Brattel)*
4. *"Creda Debonair" spin dryer (Simplex)*
5. *Chilton spin dryer*
6. *"Saturn" portable spin dryer (Brattel)*
7. *"Hoover-matic" combined washing machine and spin dryer*
8. *Burco "Tumblair" tumbler dryer*

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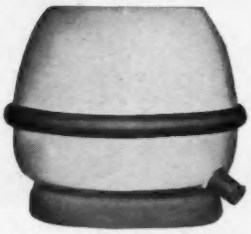

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Special Features	Price (excl. tax)	Purchase Tax
Powered pump, plastic table top available	£69 6 6	£30 8 6
Heater in lid, gyroscopic stabiliser	£31 7 7	£13 15 5
Portability, stands on draining board	£19 8 11	£8 10 7
Adjustable heat control, thermostatic control, pilot lights. Castors 15s extra	£41 10 7	£18 4 5
Portability, easily stored	£19 14 1	£8 12 11
Safety locking lid, wheels for easy mobility	£26 5 6	£11 10 6
Transparent lid	£28 10 0	£10 16 7
Matching unit with E.W.1 and E.W.4 washing machines	To be confirmed (Approximately 38 gns. including purchase tax)	
Rubber suction feet	£19 19 0	£8 15 1
Automatic brake when lid opened	£25 0 0	£10 19 5
Automatic operation	£92 0 0	£40 7 4
Thermal cut-out, auto time control, mounted on castors	£50 0 0 (4600) £54 18 3 (4601)	£21 18 9 (4600) £24 1 9 (4601)
Automatic pump operation, castors for ease of movement	£71 13 9 (3174) £67 6 10 (3444)	£32 5 3 (3174) £30 6 2 (3444)

Manufacturer or Distributor	Name or Model	Type	Size (H. W. & D. in inches)	Clothes Capacity (dry weight)	Heater Loading and/or Motor Rating	Drum Speed	Exterior Finish
KENWOOD MANUFACTURING CO., LTD., Hipley Street, Old Woking, Surrey.	"Sun-Dry" K.1	Spin	20×14 diameter	5 lb	Motor: ⅛ h.p.	1,440 r.p.m.	White vitreous enamel, grey relief
	"Sun-Dry" K.2	Spin	28×14 diameter	7 lb	Motor: ⅛ h.p.	1,440 r.p.m.	White vitreous enamel, grey relief
R. & A. MAIN, LTD., (Electrical Division), 45, Grosvenor Gardens, London, S.W.1.	"Mainspin"	Spin	27¾×16×18	6/7 lb	Motor: ¼ h.p.	2,400 r.p.m.	White stoved enamel with blue fitments or cream with green
MASTERMET PRODUCTS, LTD., Elmgrove Road, Harrow, Middlesex.	"Mastermet"	Spin	25½×17 diameter	5 lb	Motor: ⅛ h.p.	2,600 r.p.m.	White or cream stoved enamel
MORPHY-RICHARDS, LTD., 50, Conduit Street, London, W.1.	"Astral"	Spin	24⅜×15½×18⅜	8½ lb	Motor: ¼ h.p.	2,200 r.p.m.	White or cream stoved enamel
PARKINSON STOVE CO., LTD., Stechford, Birmingham, 33.	"Parkinson"	Spin	22½×15 diameter	4 lb	Motor: 1/10 h.p.	2,300 r.p.m.	White or cream vitreous enamel, blue or green fittings
PARNALL (YATE), LTD., 255, North Circular Road, Neasden, N.W.10.	"Auto-Dry"	Tumbler	29×20½×20½	6 lb	Heater: 2,750 W Motor: ⅛ h.p.	45 r.p.m.	White or cream stoved enamel, vitreous enamel top
WELMEC CORPORATION, LTD., 147, Strand, London, W.C.2.	A.E.G. "Lavalux"	Combined washing machine and spin dryer	32¼×32⅜×19⅜	7 lb	Heater: 2 kW Motor: ⅛ h.p.	1,600 r.p.m.	White vitreous enamel, black stove enamelled base
	A.E.G. Round	Spin	29×17×17½	7 lb	Motor: ⅛ h.p.	1,600 r.p.m.	White vitreous enamel
	A.E.G. Square	Spin	31×17×20	8 lb	Motor: ⅛ h.p.	1,600 r.p.m.	White vitreous enamel

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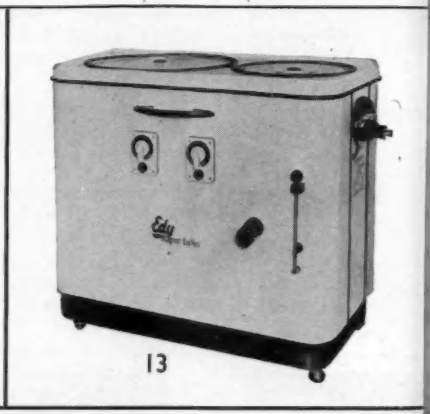

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9. *A.E.G. "Lavalux" combined washing machine and spin dryer (Welmec Corporation)*

10. *English Electric tumbler dryer*

11. *"Mainspin" spin dryer (R. & A. Main)*

12. *Morphy-Richards "Astral" spin dryer*

13. *Edy "Super-Twin" combined washing machine and spin dryer*

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Special Features	Price (excl. tax)	Purchase Tax
Rustless, rubber suction feet	£24 16 3	£10 17 10
Rustless, rubber suction feet	£28 16 7	£12 12 11
Automatic switch and brake	£25 0 5	£10 19 7
Interlocking switch, lid controls brake	£25 0 0	£10 16 7
Safety interlock, lid controls motor, foot brake	£23 8 11	£10 3 1
Foot brake, transparent lid	£24 0 0	£10 10 7
Automatic timer and door cut-out switch, fits under draining board	£38 0 0	£17 2 0
Copper spin-dryer drum, choice of laminated tops in six shades	£75 1 4	£32 18 8
Copper drum, transparent lid	£25 0 0	£10 19 5
Copper drum, stove enamelled lid	£31 5 7	£13 4 5

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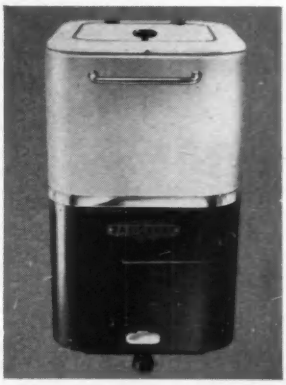

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14. *Mastermet spin dryer*
15. *Kenwood "Sun-dry" spin dryer*
16. *Parnall "Auto-Dry" tumbler dryer*
17. *A.E.G. square type spin dryer*
18. *Parkinson spin dryer*
19. *Easiclene spin dryer*

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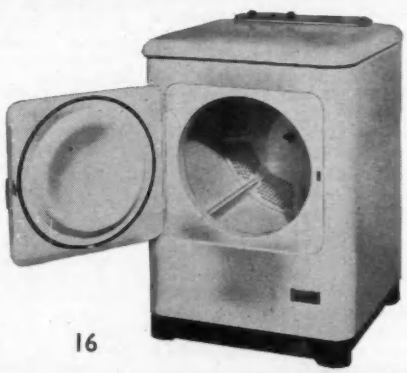

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Catalogues and Lists

BOWL FEEDERS. — Leaflet illustrating and describing bowl feeders and spiral elevators produced by the company.—**Magnetic Equipment Co., Ltd.,** Lake Works, Portchester, Hants.

CABLE TRUNKING.—Illustrated leaflet giving particulars and dimensions of the company's new range of sheet steel skirting trunking.—**Mantel Metalworkers, Ltd.,** 121, Gurney Street, London, S.E.17.

FIRE ALARM EQUIPMENT.—Illustrated catalogue dealing with the company's range of fire alarm equipment including sirens, alarm contacts, and indicators and control equipment.—**Carter & Co. (Nelson), Ltd.,** Nelson, Lancs.

LIGHTING FITTINGS.—Four leaflets giving particulars of various fluorescent lighting fittings in the company's range.—**H. W. Field & Son, Ltd.,** Harold Wood, Essex.

PNEUMATIC HANDLING PLANT.—22-page illustrated catalogue describing pneumatic handling plant and equipment produced by the company.—**Simon Handling Engineers, Ltd.,** Cheadle Heath, Stockport, Cheshire.

RECTIFIERS.—53-page catalogue describing the Siemens & Halske selenium rectifiers for which the company is the U.K. agent.—**R. H. Cole (Overseas), Ltd.,** 2, Caxton Street, London, S.W.1.

RESISTORS.—18-page catalogue dealing with "Ceramite" wire wound ceramic embedded and open wound semi-variable resistors.—**Zenith Electric Co., Ltd.,** Villiers Road, Willesden Green, London, N.W.2.

SWITCHES.—Looseleaf catalogue covering the company's range of precision miniature switches.—**Castelco (Great Britain), Ltd.,** High Street, Old Woking, Surrey.

SYNCHROS.—Broadsheet illustrating and describing the company's range of synchros, servomotors, resolvers, motor tachometers and tachometer generators.—**Muirhead & Co., Ltd.,** Beckenham, Kent.

TAPES.—Brochure and price list giving particulars of "Lassovic" p.v.c. self-adhesive tape for identification, insulation and protection.—**Smith & Nephew, Ltd.,** Welwyn Garden City, Herts.

Financial Section

STOCKS and SHARES

THE market in electrical engineering shares was generally unsettled by the General Electric Company's announcement of a decrease in its interim dividend, from 4½ to 3½ per cent, and by the board's estimate of a marked decline in profits for the twelve months ending in March. G.E.C. £1 shares were themselves marked down by about 3s 3d to 34s 3d. Those of the other big electrical groups turned sympathetically downwards, but later the tendency became firmer. In other sections of the industrial market, there were signs of a turn for the better at the beginning of this week. Government stocks have been making almost daily advances, under the impression that some reduction in Bank Rate may not be very long delayed.

G.E.C. Position

Accompanying the G.E.C. announcements was a statement from the board reporting that while the group's turnover had increased, there had been a persistence of the pressure on profit margins, as envisaged in the last annual report. It is of course the idea that this experience has become a common one in many fields of industry which explains in large part the investor's cautious attitude towards industrial shares in general at the present time. For 1956–57, the G.E.C. reduced its total distribution from 14 to 12½ per cent, on capital enlarged by a big "rights" issue of shares. The latest interim decision makes an open question of the yield basis on which the shares can for the present be regarded.

Price Changes

Leading electrical equipment shares had been making some headway before being checked by the G.E.C. announcements. After this A.E.I. shares went back to 48s 3d, but quickly resumed their advance, to 50s, on the strength of the "Sceptre III" development. English Electric remained at 47s 6d, after being 48s. Crompton Parkinson lost 3d on balance, to 8s 9d, and C. A. Parsons were 3s 9d lower at 46s 3d. Elsewhere in this market, a feature was the very strong recovery in W. T. Henley's, which recovered 3s of previous losses in rising to 14s 6d. B.I.C.C. gained 1s for the second week in succession. Still under the influence of the company's annual results and dividend, Westinghouse Brake remained firmly in favour, adding 2s 6d to earlier advances. The improvement in E.M.I. was also maintained, up to 31s 9d, while Lucas and Falk Stadelmann came in for attention. Burco Dean are now quoted ex-the one-for-two scrip issue.

General Cable Capital

For the year 1956–7 the earnings of the General Cable Manufacturing Co., whose full report has now been published, were rather better than maintained at the previous level of over £130,000, but the dividend was reduced from 30 to 24 per cent. That step was taken in order to conserve resources until plans had taken shape for dealing with the bank overdrafts. As a pre-

Price Changes in

Company or Board	Nom. Value	Middle price 3rd Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	73½	+½	3	3	4 1 3	80	70
Brit. Elec. 1974/77	100	71	+½	3	3	4 4 6	78½	66
Brit. Elec. 1976/79	100	74	+½	3½	3½	4 14 6	81½	70
Brit. Elec. 1974/79	100	85½		4½	4½	4 19 6	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	16/-		6†	6·8†	8 10 0†	19/-	15/-
East African Power	£1	18/6		7	7½	8 2 3	21/-	19/-
Nigerian Elec.	£1	16/6		10	10	12 2 6	18/6	16/6
Perak Hydro-Elec.	£1	15/-		10	12½	16 13 3	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/6		17½	17½	8 6 9	12/-	9/9
Aerialite	1/-	5/9		48	51½	8 19 3	6/9	4/9
Allen, W. H.	£1	34/6		10	10	5 16 0	47/3	33/6
Anglo-Portuguese Tel.	£1	20/9	−6d	8	8	7 14 3	27/6	20/6
Aron Elec. Ord.	£1	54/-		15	15	5 11 0	60/-	53/6
Assoc. Elec. Ord.	£1	50/-	+1/3	15	15	6 0 0	73/-	48/9
Automatic Tel. & El.	£1	60/-		15	17	5 13 3	75/-	54/6
Babcock & Wilcox	£1	43/9		15	13‡	5 18 9	82/6	54/9
Bakelite	10/-	20/-		16	15	7 10 0	24/6	20/9
Baldwin, H. J.	2/-	3/3	−3d	20	20	12 6 3	5/-	3/9
Barry's Electric	5/-	6/-		—	10	8 6 9	6/6	5/6
British Aluminium	£1	44/6	+9d	12	12	5 7 9	71/3	38/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	22/-		22½	25	5 13 9	25/-	17/-
B.I. Callender's	£1	42/3	+1/-	12½	12½	5 18 3	55/-	39/6
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	40/-		9	10	5 0 0	56/3	37/6
British Thermostat	5/-	20/-		25	25	6 5 0	27/6	21/3
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	35/-	+1/3	25	25	7 2 9	37/6	30/-
Bulgin, A. F.	1/-	4/9		50	40*	8 8 6	5/6	4/-
Burco Dean	5/-	8/6xc	−6d	20	22½	8 16 6*	9/4	5/10
Cable & Wireless: Ord.	5/-	10/6	+1/-	10	10	4 15 3	12/6	9/6
4% Loan	100	93½	+½	4	4	4 5 6	92½	89
Chloride El. Storage "A"	£1	56/3		17½	17½	6 4 6	68/9	55/9
Clarke Chapman	£1	145/-		22½	27½	3 15 9	9	5½
Cole, E. K.	5/-	16/6		17½	17½	5 6 0	23/6	16/6
Cossor, A. C.	5/-	5/3	+3d	Nil	2½	2 7 6	7/3	5/-
Crabtree	10/-	25/3	+6d	20	20	7 18 6	26/-	23/3
Crompton Parkinson Ord.	5/-	8/9	−3d	16	16	6 1 9*	11/9	9/3
De La Rue	5/-	23/9	+6d	30	35	7 7 3	24/9	16/3
Decca "A"	4/-	23/3		43½	43½	7 10 6	32/3	22/-
Desoutter	5/-	14/-		30	32½	5 16 0*	17/9	13/9
Dewhurst	2/-	7/6		16½	20	5 6 9	7/9	5/9
Dictograph Tel.	2/-	5/3		20	20*	7 12 6	6/3	5/3
Dubilier Condenser	1/-	3/3		30	30	—	5/3	3/-
Duport	5/-	8/3	−3d	25	25	7 11 6*	10/6	8/6
E.M.I.	10/-	31/9	+1/6	15	15	4 14 6	36/-	23/9
Electrical Components	5/-	7/6		25	12½*	8 6 9	8/-	6/6
Elec. Construction	£1	22/6		8½	8½	7 11 0	27/6	21/9
Elliott-Automation	5/-	11/9		—	10‡	4 5 0	12/6	10/3
Enfield Cable Ord.	£1	12/-		Nil	Nil	Nil	21/6	12/3
English Electric	£1	47/6		12½	14	5 18 0	65/-	47/6
English Electric 3½% Pref.	£1	12/3		3½	3½	6 2 6	14/3	11/3
Ericsson Tel.	5/-	18/9		20†	22†	2 18 9*†	25/-	17/-
Ever Ready	5/-	14/6		35	37½	6 9 3*	20/-	14/-
Falk Stadelmann	£1	36/9	+6d	17½	17½	9 10 6	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

liminary move in that direction, the authorised capital is to be increased from £250,000 to £325,000 by the creation of 300,000 ordinary shares of 5s each. In his review accompanying the accounts, the chairman writes with satisfaction of the advantages derived from the acquisition of the Britannic Company and from the expansion of the business in rubber and plastic cables. He reports a full order book and anticipates that conditions may become more stable than has been the case for several years. At about 12s, the 5s shares are on a yield basis of 10 per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 3rd Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	34/3	−3/3	14	12½	—	58/9	37/6
G.E.C. 6½% Pref.	£1	21/-		6½	6½	6 3 9	23/6	19/6
General Cables	5/-	12/-		30	24	10 0 0	15/6	11/6
Greenwood & Batley	£1	47/6		17½	17½	7 7 3	51/3	45/3
Hackbridge Holdings	5/-	9/3		30	20	10 16 3	21/9	11/3
Hackbridge & Hewittic	5/-	11/3		23	20	8 17 9	16/-	10/-
Head Wrightson	5/-	18/9		20	22½	—	24/3	16/6
Heatrae	2/-	4/6		15	15	6 13 3	4/9	4/-
Henley's	10/-	14/6	+3/-	11½	11½	7 18 6	17/-	11/-
Holophane	5/-	13/3		30	37½	8 9 9*	15/9	10/3
Hoover	5/-	32/6		50	50	7 13 9	44/-	24/9
I.C.I.	£1	39/9	+1/6	10	10	5 0 9	46/6	36/3
Intl. Combustion	5/-	20/-	−6d	20	22½	5 12 6	30/-	19/3
Johnson & Phillips	£1	17/6		15	10	11 8 6	34/6	18/9
Lancashire Dynamo	£1	32/6		11	11	6 15 3	45/9	33/6
Laurence, Scott	5/-	13/9		15	15	5 9 0	19/9	13/9
Lister, R. A.	£1	25/3	−6d	10	10	7 18 6	33/9	23/3
London Elec. Wire	£1	41/3		12½	12½	6 1 3	53/9	40/9
Lucas, J.	£1	29/-	+1/-	7½	7½	5 3 6	36/6	27/6
Marconi Marine	£1	30/-		10	10	6 13 3	37/-	30/-
Marryat & Scott	2/-	10/6		30	35	6 13 3	13/-	8/-
Mather & Platt	£1	46/3	−9d	15	15	6 9 9	63/9	47/-
Metal Industries	£1	26/-	+6d	Nil	9	6 18 6	30/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-		50	20*	5 6 9	20/-	11/6
Murex	£1	55/9		20	20	7 3 6	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/11	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/-		12	12	10 0 0	8/9	5/9
Parsons, C. A.	£1	46/3	−3/9	8½	7½*‡	—	71/3	45/-
Plessey	10/-	55/6	+6d	30	30	5 8 0	86/3	60/-
Pye "A" Deferred	5/-	12/-		12½	12½	5 4 3	20/-	12/-
Reyrolle	£1	82/6		16½	17½	4 4 9	110/-	72/-
Rheostatic	4/-	7/9		18½	12½*	6 9 0	10/-	7/-
Richardsons Westgarth	10/-	14/6	+6d	16½	16½	5 15 0*	20/-	13/6
Scottish Cables	4/-	13/3	+6d	27½	27½	8 6 0	19/3	13/3
Simon-Carves	5/-	24/3		28½	20*	4 2 6	36/3	23/9
Smith (England), S.	4/-	7/6		17½	20	5 6 9*	8/-	6/3
Southern Areas	£1	11/3		7½	7½	13 16 9	20/-	11/3
Strand Elec.	5/-	5/9		15	15	13 0 9	8/-	5/9
Sturtevant	5/-	17/9		15†	15†	4 4 6†	27/-	17/9
Sun Elec.	£1	47/6		25	25	10 10 6	47/6	42/-
Switchgear & Cowans	5/-	8/9	−6d	25	25	—	15/6	9/6
Taylor Tunnicliff	5/-	12/3	+6d	15	15	6 2 6	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	21/6		8½	8½	7 18 3	31/-	23/6
Telephone Mfg.	5/-	5/3		10	10	9 10 6	8/-	5/3
Telephone Rentals	5/-	10/3		12½	12½	6 2 0	12/6	9/6
Thompson (John)	5/-	23/6	−6d	25	25	5 6 6	37/-	23/6
Thorn Elec.	5/-	20/6	−3d	15	17½	4 5 3	26/3	16/3
Thornycroft	£1	25/3	−1/3	12½	12½	9 18 0	37/6	21/3
Tube Investments	£1	51/9	+6d	13½	15	5 16 0	70/-	51/3
Vactric	5/-	14/6		17½	25	8 12 6	23/9	12/9
Veritys	5/-	5/3		12½	12½	11 18 3	9/3	6/9
Walsall Conduits	4/-	11/9		20	20	6 16 3	15/-	11/-
Ward & Goldstone	5/-	24/6	−6d	35	40	4 1 9*	29/-	18/6
Watford	2/-	6/-		25	25	8 6 9	6/9	5/9
Westinghouse	£1	36/3	+2/6	18	10*	5 10 3	41/3	28/9
West, Allen	5/-	10/-	+3d	15	15	—	13/6	9/6
Wolf Electric	5/-	9/-		20	20	5 11 0*	13/9	8/9

Cable & Wireless Issues

With the preliminary statement of the 1957 results, Cable & Wireless announce proposals for increasing the ordinary capital by offers of one free share for every ten held, by way of a capitalisation of reserves, and of a further one share, at a price of 5s, for each five shares held, by way of "rights." For 1957 the company reports an improvement in revenues, after tax, from £620,000 to £662,000, of which £348,000 net goes out in dividends. The ordinary distribution is brought up to 10 per cent, as before, and the directors expect that in the normal course of events this year's earnings will be sufficient to maintain the same rate on the larger capital. Following these announcements the price of the 5s shares improved sharply to 10s 6d. According to the last balance sheet, Cable & Wireless held investments worth upwards of £23 million.

Pifco Holdings

Introduced to the market last April at a price of a little over 6s, the 4s ordinary shares of Pifco Holdings have been quoted lately at around 9s 6d. This company has recently paid an interim dividend of 7½ per cent, which is 2½ per cent more than the rate forecast originally in the prospectus, but is not intended necessarily to indicate a total distribution larger than the 15 per cent which the directors anticipated then for the period ending next April. On that basis the prospective yield on the shares is 6 guineas per cent. In a progress report to shareholders, the company showed that profits of the operating company for 1956–57 came out well above previous estimates at £193,000. Most of these were pre-acquisition profits and were not available for distribution. Turnover in the first six months of the current year was stated to have been larger than in the previous corresponding period.

Recent Issues

Babcock & Wilcox £1 new ordinary shares maintained a premium of around 24s on the price of 20s at which they are offered to shareholders. They become fully paid-up by next Tuesday, 11th February. On the same day the application lists close for the company's offer of £2 million 6 per cent debenture stock, to which stockholders are invited to subscribe at a price of 97. Given a continuance of the strong trend in the gilt-edged market, the issue is expected to meet with a good public demand when dealings begin. The recently issued Richardsons Westgarth 6 per cent loan, carrying rights of conversion later into the company's ordinary shares, is among the most favoured stocks of this now very popular description. The premium on the issue price of 99 expanded to 6 points.

REPORTS and DIVIDENDS

The General Electric Co., Ltd., has announced an interim ordinary dividend of 3½ per cent (against 4½ per cent). In making the announcement, the board states that, while the turnover has shown an increase, the pressure on profit margins envisaged in last year's directors' report has continued. The provisional results for the first nine months' trading, together with an estimate for the remainder of the financial year, indicate a marked decline in the profits for the year ending next month.

Cable & Wireless (Holding), Ltd.—The group earnings for 1957 (all attributable to the holding company), after deducting £505,000 for taxation, are £662,000, as compared with £620,222 for 1956. General reserve receives £230,000 and the proposed final quarterly dividend is 2½ per cent, maintaining the distribution for the year at 10 per cent.

It is proposed to make a one-for-ten free scrip issue of 2,420,000 shares of 5s each and a one-for-five rights issue of a further 4,840,000 shares at par. The shares involved in the scrip issue will rank for all 1958 dividends, but the shares to be issued by way of rights will not participate in the first quarterly dividend for that year.

The General Cable Manufacturing Co., Ltd., reports a group trading profit for the year ended 30th September last of £184,942, as compared with £185,687 for the preceding year. After meeting all charges, including £75,606 for taxation, the net balance is £131,857 (against £130,261). As has already been announced, it is proposed to reduce the second interim (and final) ordinary dividend to 12 per cent, making 24 per cent for the year (against 30 per cent), the board having decided that it is desirable to conserve the finances of the company until a funding operation has been carried through which will allow the bank overdraft to be liquidated. The group balance carried forward is £90,697 (against £67,516 brought in). It is proposed to increase the authorised capital to £325,000 by the creation of 300,000 ordinary shares of 5s each. This is the first step necessary to allow a funding operation to be carried out.

In his review of the year, Mr. C. W. R. Pantlin (chairman) says that the satisfactory result was achieved despite the fact that throughout the year trading was overshadowed by difficulties caused by the continued steady fall in the price of copper (from £280 at the beginning of the period to £180 per ton at the end), and the severity of competition throughout the whole range of their products continued progressively. The low levels to which the net selling prices of standard rubber and plastic wiring cables have been depressed in that particular section of the cable industry leave no margin at all for stock losses made inevitable by the reductions in selling prices, which have been a recurrent feature since early in 1956.

The advantages flowing from the acquisition of the Britannic Cables, Ltd., which directly extended the company's interests into a section of the cable industry which was inherently less vulnerable to wide and rapid fluctuations in the prices of copper and other principal raw materials, are emphasised by the maintenance of last year's profit level. Further, the expansion of the company's business in rubber and plastic cables, which allowed full capacity production at both works, helped to offset the trading difficulties already mentioned in that particular section. Finally, the results were achieved in face of a recession in orders for power cables during the summer months which prevented them from repeating in the second half of the year the satisfactory earnings obtained from that section of the business in the first six months. Both companies have started the current year with full order books, and there are good grounds to justify the hope that trading conditions are likely to be more stable than for several years past.

Relay Exchanges, Ltd.—At an extraordinary general meeting held on 30th January a resolution for increasing the capital of the company to £1,000,000 by the creation of 1,000,000 ordinary shares of 5s each, was approved.

British Relay Wireless & Television, Ltd., has announced an interim dividend of 5 per cent (unchanged).

Electrical Components, Ltd., has declared an interim dividend of 5 per cent (unchanged).

New Companies

Yorkshire Imperial Metals, Ltd.—Registered 21st January. Capital £100. To carry into effect a merger of the undertaking of the Yorkshire Copper Works, Ltd., with the undertaking comprising the production, sale and distribution of copper and copper alloy tubes, ferrules, plates and tube fittings, and lead and lead alloy sheet and pipe, and zinc chloride carried on by the Metals Division of Imperial Chemical Industries, Ltd., by acquiring the whole of the undertaking of the said Yorkshire Copper Works, Ltd., and the aforesaid undertaking carried on by the Metals Division of Imperial Chemical Industries, Ltd., etc. Solicitors: Linklaters & Paines, 59-67, Gresham Street, E.C.2.

Headlands (Leyton), Ltd.—Registered 21st January. Capital £1,000. Wholesale and retail dealers in and agents for manufacturers, manufacturers of heavy electrical equipment, switchgear, conduits, washing and cleaning machines, wringers, mangles, etc. Directors: F. V. Headland and Marjorie E. Headland. Regd. office: 593, High Road, Leyton, E.10.

Electronic Reproducers, Ltd.—Registered 27th January. Capital £10,000. Regd. office: 39, Dover Street, W.1.

W. Williams (Lighting), Ltd.—Registered 23rd January. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, radio and television receivers, components, fittings, parts and apparatus, electrical accumulators and batteries, lampshades, etc. W. Williams is the first director. Regd. office: 69, Wigmore Street, W.1.

Renolt Electrical Co., Ltd.—Registered 21st January. Capital £1,000. Manufacturers of and dealers in electrical appliances, goods and equipment of all kinds, radio and television sets, washing machines, etc. Directors: B. Reynolds and C. Holt. Regd. office: 33a, Withy Grove, Manchester, 4.

E. F. Hazlewood, Ltd.—Registered 21st January. Capital £100. Electrical engineers, etc. Directors: E. F. Hazlewood and Mrs. Evelyn D. Hazlewood. Regd. office: 63, Gales Drive, Crawley.

Isaacs & Phillips, Ltd.—Registered 12th December. Capital £100. Manufacturers of and dealers in electrical apparatus and equipment of all kinds, etc. Directors: L. J. Isaacs and H. A. Phillips. Regd. office: 46, High Street, Poole, Dorset.

Gaylite, Ltd.—Registered 12th December. Capital £10,000. Electrical, mechanical, lighting, heating, motor and general engineers, etc. Directors: A. W. Beutell (director of Linolite, Ltd.) and V. F. Beutell. Regd. office: The Mill Works, Malmesbury, Wilts.

Colmore Electrical, Ltd.—Registered 18th December. Capital £2,000. Manufacturers of and dealers in artificial lighting apparatus, etc. Directors: P. Sims, C. C. Reeder and J. B. Halliwell. Regd. office: Sutton Road, Plymouth, Devon.

Himpfen-Hale, Ltd. — Registered 6th January. Capital £100. Armature winders and repairers, etc. Directors: D. J. Himpfen and P. J. Hale. Regd. office: 136, The Avenue, Highams Park, E.4.

Relay Specialists (Manufacturing), Ltd.—Registered 23rd January. Capital £100. Manufacturers of and wholesale dealers in electrical, radio and television components, etc. Directors: A. Davis and Muriel Kelley. Regd. office: 3, Oxford Street, W.1.

Bracewell & Prior Electrical Contractors, Ltd.—Registered 1st January. Capital £4,000. Manufacturers of and dealers in radio goods, radio receivers, etc. Directors: S. Bracewell, K. R. Bracewell and A. Brown. Regd. office: South Street, Bacup, Lancs.

A.C.M. Electronics, Ltd.—Registered 1st January. Capital £10,000. Electronic, atomic, radio, electrical, motor and general engineers, etc. Directors: A. C. Mantica, L. S. Smith and S. J. S. Parker. Regd. office: 61, Osborne Road, Acton, W.3.

Photoelectronics (M.O.M.), Ltd.—Registered 31st December. Capital £3,400. Manufacturers of and dealers in photo-electric and electronic controls, selenium and other light sensitive cells, bridges and apparatus, etc. Regd. office: 6, Suffolk Street, S.W.1.

Group Electrics, Ltd.—Registered 31st December. Capital £100. Manufacturers of and wholesale and retail dealers in and agents for manufacturers of domestic, household and general electrical and other equipment and appliances, etc. R. Smith is the first director. Regd. office: 370, Croft Road, Nuneaton.

Electronic Vibrators, Ltd.—Registered 15th January. Capital £100. Electrical and mechanical engineers and manufacturers of components for radio, television and electronic industries, etc. Solicitors: Henry E. Goodrich, 3, Field Court, Gray's Inn, W.C.1.

C.W. Radio Electric, Ltd.—Registered 15th January. Capital £500. Radio engineers, electricians, electrical engineers. Directors: C. A. E. Wildman and Edith M. Wildman. Solicitors: Menasse & Tobin, 146, Bishopsgate, E.C.2.

Vacuum Electronic, Ltd.—Registered 15th January. Capital £100. Research and development into and manufacture and deal in electronic and vacuum apparatus and ancillary equipment, etc. Directors: R. A. Barnett and G. Rosen. Regd. office: 44, Hatton Garden, E.C.1.

Clock Systems, Ltd.—Registered 15th January. Capital £1,000. Manufacturers, hirers, renters and repairers of, and wholesale and retail dealers in time and other clock recording systems, internal and external telephones and radio, electrical and mechanical

apparatus, etc. Directors: R. A. Harrison and L. E. Coulson. Regd. office: 207 Victoria Street, S.W.1.

Birmingham Armature Co., Ltd.—Registered 16th January. Capital £1,000. Electrical engineers and contractors, manufacturers of and dealers in armatures, dynamos, etc. Directors: A. J. Plummer and L. A. Davies. Regd. office: 2, Jakeman Walk, Birmingham, 12.

Cawkell Research & Electronics, Ltd.—Registered 20th January. Capital £14,000. Electronic, precision, production, motor, electrical, mechanical, consulting and general engineers, etc. Directors: A. E. Cawkell and J. R. Rotheroe. Regd. office: Central Hull Buildings, South Road, Southall, Middx.

Cartwright & Sons (Agencies), Ltd.—Registered 31st December. Capital £100. Manufacturers, factors and distributors of electrical equipment of all kinds, etc. Directors: G. W. Cartwright, J. A. Cartwright, D. W. Cartwright and A. W. Cartwright. Regd. office: 199, St. Vincent Street, Glasgow, C.2.

C. & N. (Electrical), Ltd.—Registered 17th January. Capital £10,000. To acquire the electrical engineering and electronics branch of the business now carried on by Camper and Nicholsons, Ltd., manufacturers of and dealers in electrical and electronic apparatus, etc. Directors: J. W. Nicholson and K. G. W. Webb. Regd. office: The Green, Gosport, Hants.

Cyril Howarth & Son, Ltd.—Registered 28th January. Capital £3,000. Electrical and mechanical engineers and contractors, manufacturers of and dealers in radio and television apparatus, etc. C. Howarth is governing director. Regd. office: 251, Holdenhurst Road, Bournemouth.

Servo Units, Ltd.—Registered 24th January. Capital £2,000. Electrical engineers and contractors; inventors, designers, manufacturers of and dealers in and traders in Servo Units, etc. Directors: J. P. Harvey and Claire M. E. Harvey both of The Croft, Gough Road, Fleet, Hants.

Archer Gillespie, Ltd.—Registered 24th January. Capital £100. Manufacturers, repairers, servicers and hirers out of and wholesale and retail dealers in radio, electrical and mechanical apparatus, etc. Directors: R. J. Archer and H. J. Gillespie. Regd. office: 231, Richmond Road, East Twickenham.

Tele-Gun Electronics, Ltd.—Registered 21st January. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: F. Mitchell, L. Dunn and M. R. Lawrence. Regd. office: 76, New Oxford Street, W.C.1.

Liquidations

Jack Harvey, Ltd., dealers in electrical and mechanical apparatus, 7-9, South Street, Havant.—Last day for receiving proofs for dividend 12th February. Liquidator, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

Direct Electrics Supply Co., Ltd., distributors of domestic electrical appliances, 73-74, Marylebone High Street, London, W.1.—Winding up voluntarily. Liquidator, Mr. H. W. Pitt, 100, Park Street, Grosvenor Square, London, W.1, appointed 16th January. Particulars of claims to the liquidator by 28th February.

South Essex Electrical Installations, Ltd. (creditors' voluntary winding up).—Meetings of members and creditors on 28th February at the offices of Richard H. Nerney & Co., 141, Moorgate, London, E.C.2, to receive an account of the winding up by the liquidator, Mr. V. L. Bell.

President Electrical Appliances, Ltd., distributors of electrical appliances, 108, Park Street, London, W.1.—At an extraordinary meeting of the company held on 9th January, at which it was decided that the company should be wound up, the meeting appointed Mr. W. J. H. Wilsher as liquidator. On the same day, however, the creditors appointed Mr. F. E. Winter, 35, Bedford Row, W.C.1, and Mr. H. C. Hedges, 4, Charterhouse Square, E.C.1, as joint liquidators.

Bankruptcies

G. W. South, trading as G. W. South & Co., at High Street, Navenby, Lincs, radio and electrical engineer.—First and final dividend of 10⅞d in the £, payable at 27, Regent Street, Park Row, Nottingham.

N. W. Ives, North Street, Burnham Market, Norfolk, radio, cycle and electrical engineer.—Receiving order made 23rd January on debtor's own petition.

G. B. Solomon, 57, Fore Street, St. Columb, Cornwall, trading as St. Columb Radio, radio and electrical dealer.—First dividend of 3s 9d in the £, payable at 50, The Terrace, Torquay.

A. H. Ward, 1, Fleet Street, Keyham, Devonport, Plymouth, grocer and general dealer, formerly carrying on business there under the style of Fleet Electrics as an electrical dealer.—Trustee, Mr. R. A. D. Copper, 1st Floor, Royal Building, St. Andrew's Cross, Plymouth, Official Receiver, released 7th January.

J. G. Sims, 57, Over Lane, Openwoodgate, Belper, Derbyshire, trading as J.G.S. Radio Service, radio and television retailer and electrical contractor.—First and final dividend of 4s 2d in the £, payable on and after 14th February at 126, Colmore Row, Birmingham, 3.

G. H. Evans, High Street, Mayfield, Sussex, trading as G. H. Evans & Co., radio, electrical and television engineer.—Trustee, Mr. J. S. Bradley-Hole, 7, Old Steine, Brighton, 1, released 7th January.

Trade with Russia and Eastern Bloc Countries

WITHIN the Eastern Bloc, Russia is naturally the principal market for electrical products, but there was a decline in her electrical imports from the West in 1955-56 (valued at £4·9 million). This was mainly due to a falling off in trade with the United Kingdom.

Table 1 shows that within Western Europe, the United Kingdom is by far the largest supplier to the "satellite" countries, followed by West Germany and Austria. As the foreign trade of the Eastern Bloc countries is conducted by state-owned trade organisations, future trade will continue to be in line with planned economic developments.

The trade offensive conducted by Russia and her satellites in certain under-developed countries by offers of technical and financial assistance is steadily increasing. This is in line with Russia's latest "mobilisation of technical talents." Unlike the Western countries, her industrial production is not determined by home demand but by the various planning authorities.

The rapid growth in Russian industrial production is shown in Table 2.

Similar industrial expansion can be observed in the rest of the Eastern Bloc countries and competition from these will steadily increase.

TABLE 2.—GROWTH OF RUSSIA'S INDUSTRIAL PRODUCTION

Product	1956	Percentage increase in 1956 over 1940	1950	1955
Steel (million tons)	48·6	265	178	107
Coal ,, ,,	429·0	259	164	110
Gas (milliard cubic metres)	13·7	403	221	132
Power (,, kWh)	192·0	397	210	113
Steam and gas turbines (000 kW)	4,226·0	435	177	104
Water turbines ,, ,,	1,581·0	761	502	106
Turbine driven generators and alternators (000 kW)	5,184·0	1,100	555	115
Motors (thousands)	1,714·0	653	212	111
Radio and TV sets (millions)	4·3	2,600	393	106
Refrigerators (thousands)	224·0	6,500	1,860	148

TABLE 1.—ELECTRICAL EXPORTS FROM WEST TO EAST EUROPE (£ million)

Importing Countries → / Exporting Countries	Bulgaria		Czecho-slovakia		E. Germany		Hungary		Poland		Roumania		Russia		Total	
	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956
Austria	0·11	0·11	0·18	0·25	0·07	0·14	0·07	0·07	0·61	0·75	—	0·036	0·29	0·82	1·33	2·176
Belgium	—	—	0·11	0·14	—	0·11	—	—	0·036	0·036	0·11	—	0·39	0·21	0·646	0·496
Denmark	—	—	—	0·07	—	—	—	—	0·18	0·21	—	—	0·036	0·11	0·216	0·39
Finland	—	—	—	—	—	—	—	—	—	—	—	—	0·50	0·42	0·50	0·42
France	—	—	—	0·07	—	—	—	0·036	0·25	0·29	—	—	0·36	0·25	0·61	0·646
W. Germany	0·036	0·11	0·25	0·57	n.a.	n.a.	0·47	0·53	0·29	0·93	0·07	0·14	0·036	0·25	1·152	2·53
Italy	—	—	—	0·036	—	—	—	0·036	0·75	0·14	—	—	0·07	0·036	0·82	0·248
Netherlands	—	—	—	0·07	—	—	—	0·036	0·14	0·11	—	—	—	—	0·14	0·216
Sweden	—	—	—	0·11	—	—	—	—	0·79	0·47	—	—	0·39	0·29	1·18	0·87
Switzerland	—	—	0·25	0·29	—	0·036	0·07	0·036	0·07	0·36	0·036	0·036	—	0·14	0·426	0·898
United Kingdom	0·36	—	0·036	0·07	0·036	0·07	0·11	0·14	0·21	0·32	—	—	3·73	2·41	4·482	3·01
Total	0·506	0·22	0·826	1·676	0·106	0·356	0·72	0·884	3·326	3·616	0·216	0·212	5·802	4·936	11·502	11·900

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 12th February from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

15508. Electric & Musical Industries, Ltd. —Electron discharge devices incorporating electron multipliers. 26th May, 1954. (790416.)

1954

13701. International Business Machines Corporation.—Transistors and methods of manufacture of same. 11th May, 1954. (790403.)

14562. Automatic Electric Laboratories, Inc.—Frequency correcting arrangements. 18th May, 1954. (790479.)

21126. Igranic Electric Co., Ltd.—Electric switches and snap-acting mechanisms therefor. 20th July, 1954. (790682.)

22184. M-O Valve Co., Ltd.—Electric-discharge devices. 31st October, 1955. (790545.)

23086. Eitel-McCullough, Inc.—Velocity modulated electron tube apparatus. 9th August, 1954. (790405.)

33113. Electric & Musical Industries, Ltd. —Machines for winding wire. 16th November, 1955. (790423.)

37382. International Business Machines Corporation.—Binary trigger circuit employing single transistor. 24th December, 1954. (790404.)

1955

894. Ferguson Radio Corporation, Ltd.— Synchronisation of television receivers. 11th January, 1956. (790485.)

3584. British Thomson-Houston Co., Ltd. —Two-position electronic trigger circuit arrangements. 7th February, 1956. (790488.)

3854. Philips Electrical Industries, Ltd.— Cathode-ray tubes and circuits therefor. 9th February, 1955. (790427.)

4899. Light & Power Accessories Co., Ltd., and Lott, F. J.—Cable grip or gland for electrical fittings. 17th February, 1956. (790428.)

5065. Defensor Akt.-Ges.—Electrical systems for transmitting speech in two directions. 21st February, 1955. (790489.)

5969. Ashley Accessories, Ltd.—Lampholders for tubular electric lamps. 10th February, 1956. (790687.)

8037. General Electric Co., Ltd.—Heat transfer arrangements. 14th March, 1956. (790688.)

9642. Hoover, Ltd.—Clothes washing machines incorporating wringers. 29th March, 1956. (790433.)

10579. Electric & Musical Industries, Ltd. —Oscillation generating apparatus. 13th April, 1956. (790642.)

12939. Philips Electrical Industries, Ltd. —Transistor circuits. 4th May, 1955. (790690.)

12979. British Thomson-Houston Co., Ltd.—Electrical contacts. 4th May, 1956. (790435.)

13733. Marconi's Wireless Telegraph Co., Ltd.—Torque meters. 3rd April, 1956. (790692.)

16634. Bruno, A., and Galman, H.— Alternating voltage monitoring device. 9th June, 1955. (790648.)

18565. Baldwin, H. T.—Protection apparatus for operating electric circuits with a variable time lag. 27th June, 1956. (790699.)

22226. Siemens-Schuckertwerke Akt.-Ges. —Dry rectifier assemblies. 2nd August, 1955. (790656.)

22674. General Electric Co., Ltd.— Reflectors and electric fires. 13th July, 1956. (790441.)

23590. Pensabene, N.—Electric induction motors. 18th July, 1956. (790566.)

23617. General Electric Co.—Radiant energy intensification systems. 16th August, 1955. (790409.)

24737. Johnson, R. N.—Controlling photographic exposure by photo-electric means. 29th August, 1955. (790509.)

25440. CKD Ceska Lipa, Narodni Podnik, and Cink, A.—Travelling automatic arc welding machine. 5th September, 1955. (790511.)

26542. Standard Telephones & Cables, Ltd.—Electrolytic condenser. 16th September, 1955. (790706.)

27231. Bendix Aviation Corporation.— Electromagnetic plunger pump. 23rd September, 1955. (790570.)

27929. Bendix Aviation Corporation.— Automatically regulated a.c./d.c. convertors. 30th September, 1955. (790515.)

30383. Telefonaktiebolaget L. M. Ericsson.—Signalling means for use in an automatic telephone system or the like. 24th October, 1955. (790442.)

30836. Hazeltine Corporation.—Matrixing apparatus for colour television signals. 6th September, 1954. (Divided out of 790407.) (790408.)

33266. Philips Electrical Industries, Ltd. —Electric motors. 21st November, 1955. (790574.)

33771. Mochi, E. G., Lipparini, U., and Forlani, L.—Method for the production of housings for electrical components. 24th November, 1955. (790713.)

35935. Powers - Samas Accounting Machines, Ltd.—Electronic computing machines. 9th November, 1956. (790523.)

36160. Philips Electrical Industries, Ltd. —H.f. tuning coils. 16th December, 1955. (790716.)

36879. General Electric Co.—Electrical computing apparatus. 23rd December, 1955. (790578.)

37109. Teleprompter Corporation.—Script display system including switching apparatus for control of auxiliary electrical circuits. 28th December, 1955. (790719.)

37413. Standard Telephones & Cables, Ltd.—Direction finding system. 30th December, 1955. (790526.)

1956

2019. General Electric Co.—Electric discharge devices. 20th January, 1956. (790528.)

2180. Proctor Electric Co.—Thermal wattage controllers. 23rd January, 1956. (790722.)

2478. Robertshaw-Fulton Controls Co.— Thermostatic control devices for controlling the flow of fluid. 25th January, 1956. (790724.)

4766. Welwyn Electrical Laboratories, Ltd.—Electrical circuit elements coated with insulating coatings. 15th February, 1956. (790668.)

5781. Westinghouse Electric International Co.—Centrifugal fans. 24th February, 1956. (790669.)

8304. Standard Telephones & Cables, Ltd.—Induction coil incorporating polarised electromagnetic ringer. 16th March, 1956. (790453.)

9863. General Electric Co.—Control of reversible self-starting single-phase motors. 29th March, 1956. (790730.)

10447. Compagnie Générale de Télégraphie sans Fil.—Mechanical triggering devices for electric circuits. 5th April, 1956. (790535.)

11234. Telefonaktiebolaget L. M. Ericsson.—Antennæ. 12th April, 1956. (790589.)

12483. Bliss Co., E. W.—Electric automation control device. 24th April, 1956. (790732.)

12505. Western Electric Co., Inc.—Non-reciprocal microwave transmission device. 24th April, 1956. (790538.)

17766. Westinghouse Electric International Co.—Auto-transformer tap changers. 8th June, 1956. (790739.)

19903. General Electric Co.—Adaptors for electric discharge devices having wire leads. 27th June, 1956. (790458.)

21760. Telefonaktiebolaget L. M. Ericsson.—Semi-automatic telephone exchanges. 13th July, 1956. (790460.)

25569. Amp, Inc.—Electrical connector for aluminium wire. 21st August, 1956. (Addition to 755272.) (790744.)

28742. Standard Telephones & Cables, Ltd. (Standard Elektrizitäts-Ges. Akt.-Ges.).— Circuit arrangement for signal transmission systems according to the frequency code system. 20th September, 1956. (790467.)

38742. Compagnie Générale d'Electricité. —Plate separators for electric accumulators. 19th December, 1956. (Addition to 739613.) (790750.)

34808. Eitel-McCullough, Inc.—Velocity modulated electron tube apparatus. 9th August, 1954. (Divided out of 790405.) (790406.)

35391. Ericsson Telephones, Ltd.— Manual telephone exchange systems. 20th November, 1956. (790609.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 15th February:—

PHILIPS. No. 753,721. Class 8. Electric shaving instruments.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

No. 759,749 (design). Class 9. Scientific, electrical, measuring and signalling apparatus and instruments, etc.—Chemring, Ltd., Bensham Manor Road, Thornton Heath, Surrey.

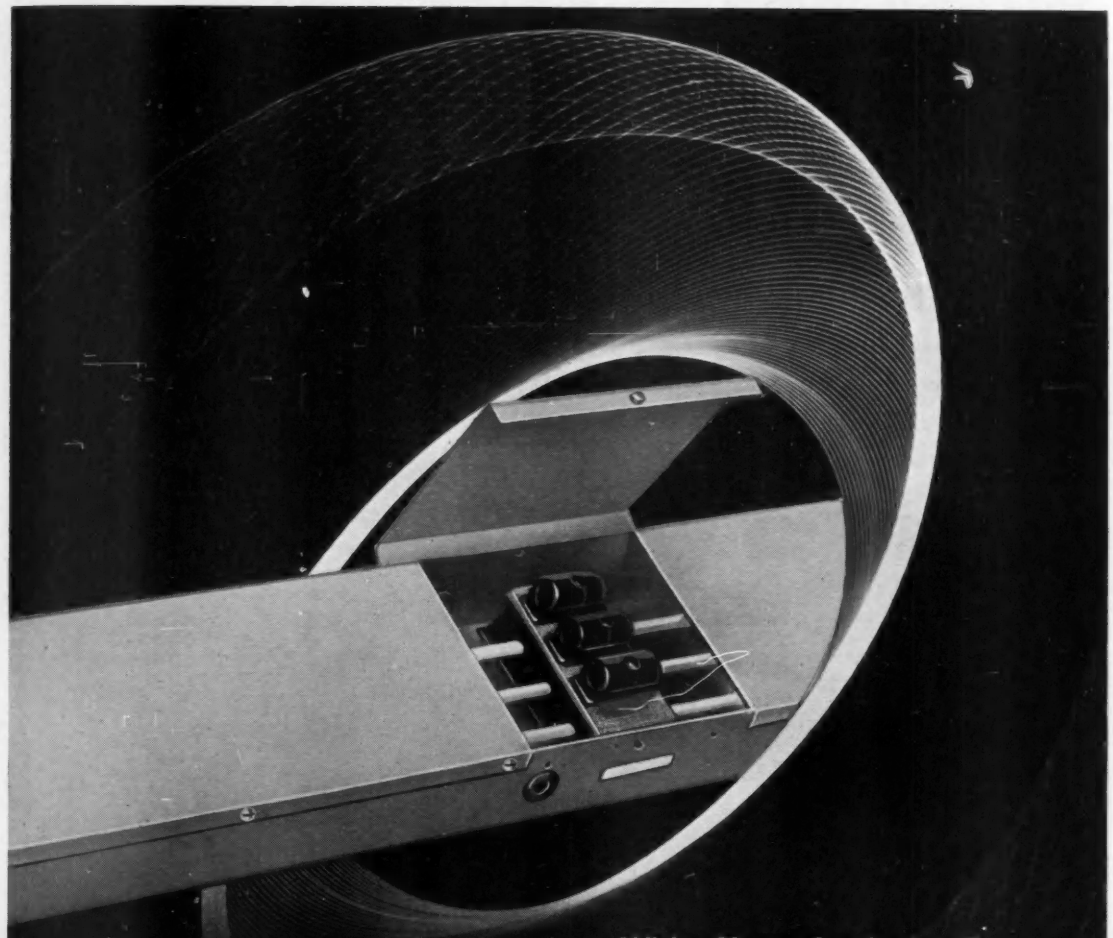
ROCKWELD. No. B763,243. Class 9. Electric welding electrodes, current transformers, and electric arc welding apparatus for use in conjunction with such transformers; electric cables for use with arc welding apparatus, electrical connections and clamp devices for earthing these cables; ammeters; and face-shields, goggles, etc., for the protection of welding operatives.—Rockweld, Ltd., Commerce Way, Croydon, Surrey.

CALYPSO. No. 769,235. Class 9. Electric batteries, cells, accumulators, radio receivers, television apparatus, gramophones, radio-gramophones, record players and cases for electric torches.—Berec Radio, Ltd., Hercules Place, Holloway, London, N.7.

METOX. No. 769,445. Class 9. Electrical apparatus and instruments.—Welwyn Electrical Laboratories, Ltd., Trading Estate, Bedlington Station, Northumberland.

OFFICEMATION. No. 769,453. Class 9. Scientific and electrical apparatus and instruments; weighing, measuring, signalling, checking (supervision) and teaching apparatus and instruments; coin or counter-freed apparatus; talking machines; cash registers; and calculating machines.—P. B. H. Cuff and W. Gibson, trading in co-partnership at 65, King's Drive, Surbiton, Surrey.

INTERDEC. No. 765,361. Class 11. Electric lighting fittings for domestic use.— Interdec, Ltd., 129, Beulah Road, Thornton Heath, Surrey.



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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 10th February

BIRMINGHAM. — College of Technology, 6 p.m. I.E.E. South Midland Supply and Utilisation Group. "British Columbia-Vancouver Island 138 kV Submarine Power Cable," by Dr. T. Ingledow, R. M. Fairfield, F. L. Davey, K. S. Brazier and J. N. Gibson.

CARDIFF.—At the South Wales Institute of Engineers, 6 p.m. I.E.E. Western Centre. "The Generation of Electricity in the London Area," by H. V. Pugh.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers, informal meeting. Discussion on "The Herbert Report and the 1957 Act," opened by E. R. Wilkinson.

NEWCASTLE-UPON-TYNE. — Neville Hall, 6.15 p.m. I.E.E. North Eastern Centre. "Supply-Voltage and Current Variations produced by a 60-ton, 3-phase Electric Arc Furnace," by Dr. B. C. Robinson and A. I. Winder.

SOUTHAMPTON.—Guildhall, 2.30 p.m. and 6.30 p.m. I.E.E. Southern Centre. Faraday Lecture on "The Electrification of the British Railways," prepared by the late G. H. Fletcher, delivered by R. Ledger.

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North West London Branch. "Industrial Welfare," by Dr. J. C. Graham.

WORCESTER.—M.E.B. Sports Club, 7.30 p.m. I.E.E. South Midland Centre. "Thermal Rating of Transformers," by H. W. Harden.

Tuesday, 11th February

ARBORFIELD.—Assembly Hall, 3 (Tels) Training Bn. R.E.M.E., 7 p.m. I.E.E. London Graduate and Student Section. "Sputnik—The Tracking of the Russian Earth Satellite," by D. L. Cooper-Jones.

BELFAST.—Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. "Electricity in Modern Commercial Horticulture," by C. A. Cameron Brown and A. W. Gray.

BRADFORD. — Y.E.B. Offices, Sunbridge Road, 7 p.m. I.E.E. North Midland Graduate and Student Section. "A Testbed for D.C. Machines and Control Gear," by J. Holgate and E. Rawnsley.

GLASGOW.—Royal College of Science and Technology, George Street, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "The Relation between Picture Size, Viewing Distance and Picture Quality, with special reference to Colour Television and to Spot-Wobble Techniques," by L. C. Jesty.

LONDON.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Electrical Industries Club. Luncheon.

Grosvenor House, Park Lane, 6.30 for 7 p.m. Electrical Contractors' Association. Annual dinner.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Utilisation Group. "Electric Control of Stage and Television Lighting," by F. P. Bentham. (Joint meeting with the Radio and Telecommunication Group.)

Manchester College of Science and Technology, Whitworth Street, 1, 7 p.m. I.E.E. North Western Graduate and Student Section. "Fourum."

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. "Modern Trends of Lighting in Industry," by A. Wilcock.

NEWCASTLE-UPON-TYNE. — Old Assembly Rooms, County Hotel, Neville Street. North East Electrical Club. Ladies' night.

PORTSMOUTH. — Wiltshire Lamb Hotel, 7.30 p.m. A.S.E.E. Portsmouth Branch. 1957 Electrical Engineers Exhibition Film.

RUGBY.—Rugby Technical College, 6.30 p.m. I.E.E. Rugby Sub-Centre. "The Development of Variable-Speed High Power Drives for Large Wind Tunnels," and "A Variable Frequency Power Installation for Large Wind Tunnel Drives," by P. McKearney, L. S. Drake and E. G. Mallalieu.

YORK.—Royal Station Hotel, 7.30 p.m. A.S.E.E. York Branch. "Heenan and Froude Electronically Controlled Variable Speed Drive Equipments," by R. H. Stannard.

Wednesday, 12th February

BIRMINGHAM.—James Watt Memorial Institute, 6.30 p.m. I.E.E. South Midland Graduate and Student Section. "Coal Winding Electrically," by G. Davis.

Birmingham Exchange and Engineering Centre, Stephenson Place, 7.30 p.m. A.S.E.E. Birmingham Branch. "Electrostatic Precipitation and its Application in Industry."

BRADFORD. — Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. Films—Calder Hall construction.

BRISTOL.—The University, 7 p.m. I.E.E. Bristol Graduate and Student Section. "Novel Methods of Speed Control applied to Standard Three-Phase Induction Motors," by G. Creighton and W. M. Somerville.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "The Relation Between Picture Size, Viewing Distance and Picture Quality, with special reference to Colour Television and to Spot-Wobble Techniques," by L. C. Jesty.

GLASGOW.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 7.30 p.m. Institute of Marine Engineers, Scottish Section. Annual general meeting, followed by "Nuclear Steam Propulsion for Merchant Ships," by W. R. Wootton.

ILFORD.—At the Ilford Club, 21a, Balfour Road, 7.30 p.m. Institution of Production Engineers, South Essex Section. "Automatic Railway Signalling in Relation to Railway Electrification," by G. W. Bentall.

LANCASTER. — N.W.E.B. Demonstration Theatre, North Road, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "Choice of Insulation and Surge Protection of Overhead Transmission Lines of 33 kV and Above," by A. M. Thomas and D. F. Oakeshott.

LONDON. — Central Hall, Westminster, 6 p.m. Institution of Electrical Engineers. Faraday Lecture on "The Electrification of the British Railways," prepared by the late G. H. Fletcher, delivered by R. Ledger.

LUTON.—Luton and Dunstable Chamber of Commerce, George Street West, 8 p.m. A.S.E.E. Luton Branch. "Thermal Storage and Floor Heating," by E. C. Green.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North Western Radio and Telecommunication Group. "The Use of Transistors in Radio and Television," by Dr. A. J. Biggs.

NORTHAMPTON.—College of Technology, 7.15 p.m. Northampton and District Electrical Association. "Frequency Modulation," by a representative of Ultra Electric.

OXFORD.—Southern Electricity Board, 37, George Street, 7 p.m. I.E.E. district meeting. "Developing Pattern of Atomic Generation," by I. Emerson.

SHEFFIELD.—University, 5 p.m. Institute of Physics, Yorkshire Branch. "Thermonuclear Power," by R. S. Pease.

WARRINGTON. — M.A.N.W.E.B. District Office, Buttermarket Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. District meeting. "The Trend in Automatic Control of Steel Mills," by A. Asbury.

WOLVERHAMPTON. — Wolverhampton and Staffordshire Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "Industrial Applications of Radio Isotopes," by R. F. Armitage.

Thursday, 13th February

BIRMINGHAM.—Birmingham Exchange and Engineering Centre, Stephenson Place, 6.30 p.m. Institute of Marine Engineers, West Midlands Section. "Annual general meeting, followed by "Developments in Marine Electrical Installations with Particular Reference to A.C. Supply," by A. N. Savage.

DUNDEE.—Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. "Some Recent Developments in Power Transformer Manufacture," by A. C. Franklin.

KETTERING. — George Hotel, 7.30 p.m. I.E.E. East Midland Centre. District meeting. "275 kV Transmission Lines," by J. D. Pierce.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilisation and Supply Sections. "Supply-Voltage and Current Variations Produced by a 60-ton, 3-phase Electric Arc Furnace," by Dr. B. C. Robinson and A. I. Winder.

Hatton Lecture Theatre, Queen Mary College (University of London), 5.30 p.m. Inaugural lecture by M. W. Humphrey Davies, Professor of Electrical Engineering, on "Electrical Engineering in the Future."

NOTTINGHAM.—Institute of Physics, Midland Branch. Visit to Physics Department, Nottingham University (3 p.m.), and talk on "Current Research at British Thomson-Houston Co., Ltd.", by L. J. Davies.

SWANSEA.—South Wales Electricity Board Showrooms, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "Electrolytic Tinning," by J. Nelsey and J. V. Peacock.

WIMBLEDON. — Prince of Wales Hotel, 7.45 p.m. A.S.E.E. South West London Branch. "Supply and Distribution of Electricity," by L. H. Welch.

Friday, 14th February

ABERDEEN. — Robert Gordon's Technical College, 7.30 p.m. I.E.E. North Scotland Sub-Centre. "Some Recent Developments in Power Transformer Manufacture," by A. C. Franklin.

LONDON.—Caxton Hall, Westminster, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "Instrumentation in a Nuclear Power Station," by R. J. Smith.

MANCHESTER.—University of Manchester, 6.30 p.m. Institute of Physics, Manchester and District Branch. Annual general meeting, followed at 7 p.m. by "The Transmission of Electrical Impulses Along Nerves," by Dr. R. D. Keynes.

NEWCASTLE-UPON-TYNE. — King's College, 6.30 p.m. I.E.E. North Eastern Graduate and Student Section (joint meeting with the Students' Sections of the North East Coast Institution of Engineers and Shipbuilders, the I.C.E. and I.Mech.E.). "Nuclear Power Stations," by A. St. John MacKeller.

Saturday, 15th February

MANCHESTER.—Woodlands Hotel, Timperley, 6 for 6.30 p.m. I.E.S. Manchester Centre. Dinner-dance.

OXFORD.—Regent's Park College, Pusey Street, 7 p.m. A.S.E.E. Oxford, Reading and Districts Branch. "Lighting Specification, Design and Planning."

Business Efficiency Exhibitions

The Office Appliance and Business Equipment Trades' Association is holding the 1958 National Business Efficiency Exhibition from 22nd to 27th September at the City Hall, Manchester. Its regional Business Efficiency Exhibition will be held from 12th to 16th May at the Ice Stadium, Nottingham. The Association, in conjunction with the Radio Communication and Electronic Engineering Association, is sponsoring the first National Electronic Computer Exhibition. This will be held at Olympia, London, from 28th November to 4th December.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia. — South Australian Railways, Adelaide. 6th March. Twenty-four (or alternatively twenty-eight) diesel engines, transmissions and associated control equipment for diesel rail cars. (E.S.B. 1748/58. Ten/30504.)*

Burma.—Burma Purchase Board, Rangoon. 17th February. Fittings and chokes for fluorescent lighting. (E.S.B. 2392/58. Ten/30595.)* Insulated cable. (E.S.B. 2389/58. Ten/30604.)*

Canada.—Manitoba Hydro-Electric Board, Winnipeg. 18th February. Radio communication system for five hydro-electric power stations. (E.S.B. 1435/58. Ten/30527.)*

Colombia.—Empresa Nacional de Telecomunicaciones, Bogota. 15th February. Automatic voltage regulators. (E.S.B. 2995/58. Ten/30715.)*

Colwyn Bay.—Corporation. 20th February. Trunk road lighting equipment. (See this issue.)

Gainsborough.—R.D.C. 14th March. Two sludge pumps, each complete with motor, starter gear, etc., at Sturton and Marton; duplicate sewage pumps, complete with motors, starters ,etc., at Sturton; duplicate sewage ejectors, complete with motors, compressors, etc., at Sturton; duplicate sewage ejectors, complete with motors, compressors, etc., at Marton. J. H. Haiste & Partners, engineers, Belmont House, 30, Wood Lane, Headingley, Leeds, 6.

Honduras.—Dirección General de Communicaciones, Tegucigalpa, D.C. 31st March. Communication circuit between Tegucigalpa and Puerto Cortés. (E.S.B. 2137/58. Ten/30563.)*

India.—Bombay State Electricity Board. 24th March. Substation equipment. (E.S.B. 2359/58. Ten/30602.)*

Damodar Valley Corporation, Calcutta. 6th March. Three blow-off tanks for the Durgapur power station. (E.S.B. 1599/58. Ten/30488.)*

Iraq.—Directorate General of Municipalities, Baghdad. 15th February. H.v. cable boxes. (E.S.B. 2366/58. Ten/30631.)*

Maesteg (Glam).—U.D.C. 22nd February. Electrical fittings (Schedule No. 24), for the year ending 31st March, 1959. L. W. Jones, surveyor, Council Offices.

New Zealand.—Auckland Electric Power Board. 28th February. L.v. cable. (E.S.B. 2023/58. Ten/30533.)*

Portuguese East Africa.—Ports, Railways and Transport Department, Lourenço Marques. 21st March. Telephone network for marshalling yard. (E.S.B. 2064/58. Ten/30562.)*

Rhodesia and Nyasaland.—Federal Tender Board, Causeway. 13th February. Underground armoured cable and cable boxes. (E.S.B. 2582/58. Ten/30642.)* Electric fires and cookers. (E.S.B. 2583-4/58. Ten/30647.)*

Bulawayo Electricity Department. 17th February. 88 kV line and transformer air-break isolating switches, fault throwing switches and post insulators. (E.S.B. 2153/58. Ten/30542.)*

Rowley Regis.—Borough Council. 21st February. Electricians' requisites for the year ending 31st March, 1959. J. Hilton, town clerk, Municipal Buildings, Old Hill, Staffs.

Salvador.—Proveeduría General de la República, San Salvador. Telephone wire and ancillary equipment. (E.S.B. 2409/58. Ten/30686.)*

Sherborne.—U.D.C. 3rd March. Electric lamps for the year ending 31st March, 1959. Engineer and surveyor, The Manor House, Newland.

South Africa.—Stores Department, South African Railways, Johannesburg. 12th February. Telegraph line material. (E.S.B. 1904/58. Ten/30518.)* 19th February. Lamps for electrical signalling. (E.S.B. 1907/58. Ten/30517.)* Fuse carriers and bases. (E.S.B. 1908/58. Ten/30521.)* Fluorescent lighting fittings. (E.S.B. 1906/58. Ten/30516.)* Cable. (E.S.B. 1909/58. Ten/30519.)* Underground armoured cable. (E.S.B. 1905/58. Ten/30528.)* 21st February. Underground armoured cable. (E.S.B. 1910/58. Ten/30529.)* 5th March. Overhead track equipment. (E.S.B. 1911/58. Ten/30549.)* 30th May. Motor vehicle batteries. (E.S.B. 1450/58. Ten/30463.)*

Union Tender and Supplies Board, Pretoria. 17th February. Insulated wire. (E.S.B. 2215/58. Ten/30552.)* Galvanised steel off-set sleeves. (E.S.B. 2214/58. Ten/30587.)* 20th February. Forty-eight portable electric drilling machines. (E.S.B. 2212/58. Ten/30561.)* Polyethylene insulated and sheathed underground cable. (E.S.B. 2217/58. Ten/30560.)* Radio valves. (E.S.B. 2216/58. Ten/30553.)*

Johannesburg City Council. 20th February. Armature and field coils. (E.S.B. 2295/58. Ten/30641.)*

Thorne.—Parish Council. 22nd February. Street lighting equipment. (See this issue.)

Walthamstow.—Borough Council. 21st February. Electrical conduit tube, electrical cords and cables, and electric lamps for the year ending 31st March, 1959. Borough architect, engineer and surveyor, Town Hall, E.17.

ORDERS PLACED

Bexhill-on-Sea. — Corporation. Recommended. Lanterns, brackets and ancillary equipment, columns, and the installation of a lighting system on the trunk road between Cooden Sea Road at Little Common and the junction with Picknill Green Lane (£2,962). —Revo Electric Co.

Homewood (Cumberland).—Electrical installation in Stage I of new hospital for Newcastle-upon-Tyne Regional Hospital Board (£30,000).—George Bowman.

Manchester.—North Western Electricity Board. Five-panel 33 kV, 750 MVA switchboard, associated 7-panel control and relay board, and 2-panel busbar protection relay board for Moss Nook substation.—Metropolitan-Vickers Electrical Co.

Stockton-on-Tees.—Education Committee. Electrical installation in Fairfield Junior School, Stockton (£2,090). — Williams Brothers, Middlesbrough.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Acton.—Dwellings (44), East Acton Lane; borough engineer.

Ayr.—Junior secondary school, Belmont Road (£293,480) and houses (104), Belmont South; burgh surveyor, Municipal Offices.

Bedford.—Flats (204), town centre; borough engineer.

Beverley.—Block of five-storey flats and six-storey maisonnettes, Wilbert Lane; E. Bailey, town clerk, Municipal Offices, Beverley, East Yorks.

Bristol.—Warehouse and offices, Wilder Street; Ward & Co., 128, Cheltenham Parade Road.

Canterbury.—Houses (153), Tenterden Drive, Hales Place, for City Council; J. E. Rhodes, city engineer, Dane John.

Carlisle. — Town Hall and municipal offices; C. B. Pearson & Son, architects, 24, Loxford Street, Manchester.

Cramlington.—Site clearance for 150 houses and a school; surveyor to Seaton Valley U.D.C., Northumberland.

Cumberland.—School building programme, 1958-59, includes secondary schools at Penrith (£197,000) and Distington (£142,000) and extensions to primary school at Stoneraise (£18,000); J. H. Haughan, county architect, Portland Square, Carlisle.

Dagenham.—Offices for Devonish & Co.; Charles S. Boxer, builder, 227, Reede Road.

Durham.—Junior school, Billingham, and second instalment of technical college, Bishop Auckland; county architect, Durham.

Easington (Co. Durham).—Pithead baths, Wingate Grange Colliery; N.C.B. Architects' Department, 24, The Side, Newcastle-on-Tyne.

Easthampstead.—Houses (78), Deepfield Road, Bracknell, for R.D.C.; D. Freeman, architect, Old Bank Chambers, High Street, Bracknell, Berks.

Enfield.—Houses (47), Crescent Road; Haselwood Estates, Ltd., 118, Chancery Lane, London, W.C.2.

Factory extension; Gor-ray, Ltd., Great Cambridge Road.

Flats (32), London Road and Monks Close; A. C. Nicholas, Ltd., 232, Lavender Hill.

Falkirk.—Garage, service station, showroom and house, 62-80, Grahams Road; S.M.T. Co., Ltd., Fountainbridge, Edinburgh.

Great Yarmouth.—Works extensions for Hartmann Fibre Co., South Denes; Bush Builders, Ltd., Milne Cross Lane, Norwich.

Hastings.—First instalment of high school for girls (£55,745); William Ellis (Etchingham), Ltd., Etchingham, East Sussex.

Hitchin.—Flats (36), Westmill estate; U.D.C. surveyor.

Radstock.—Courthouse for Somerset C.C.; R. O. Harris, county architect, Park Street, Taunton.

Reading.—Clinic and dental centre, School Road; borough architect.

Ripon.—Housing scheme at Allhallowgate; city engineer.

Rugby.—Completion of Harris C.E. Secondary School in 1958-59 programme (£67,600); county architect, Warwick.

St. Neots.—Instalment of new secondary modern school (1958-59 programme); county architect, Huntingdon.

Salford.—Second phase of Royal Technical College extensions (£750,000); John Turner & Sons, Ltd., builders, William Henry Street, Preston.

Scarborough.—Flats (24), Regent Street; H. B. Overfield, borough engineer.

Swansea.—Flats (99), Blaen-y-Maes estate; Staverton Builders, Ltd., Staverton Bridge Mills, Totnes.

Upwood.—Four-class school (£35,000), 1958-59 programme; county architect, Huntingdon.

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* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

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Illustration on right shows an indoor totally enclosed unit construction type "Y" switchboard with incoming duplicate busbars feeding common outgoing circuits by means of interlocked fused switches of both 300 amp and 500 amp capacity.

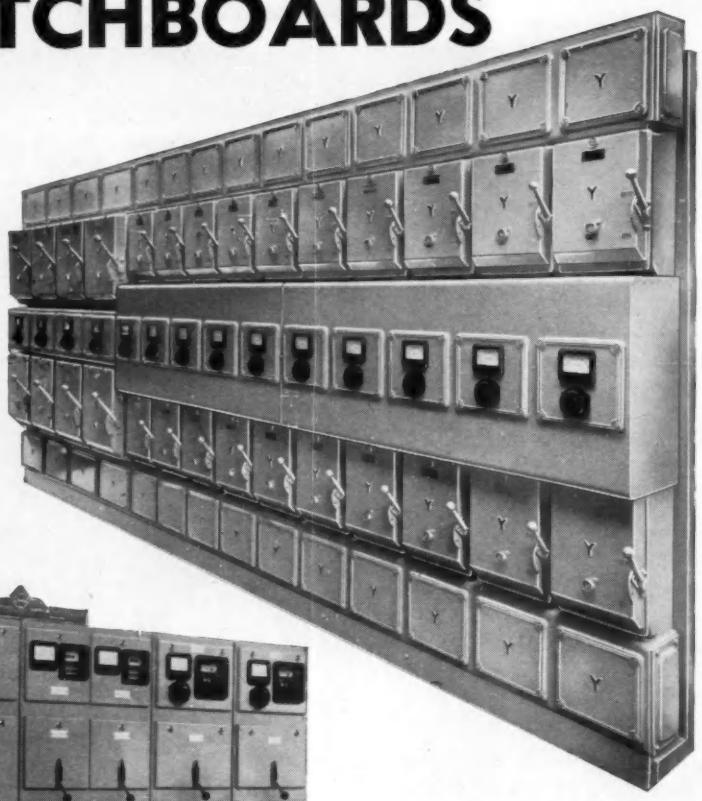

Illustration below shows an indoor all-isolating cubicle construction switchboard having individual metering on the outgoing fused switches of 60 amp, 160 amp and 300 amp capacity.

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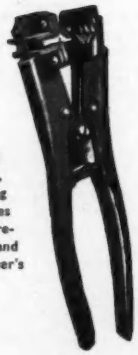
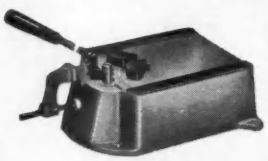


Stripping without teasing



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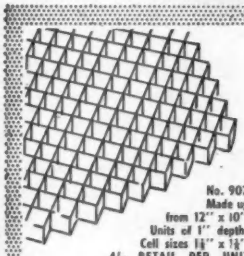

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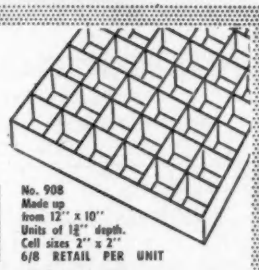

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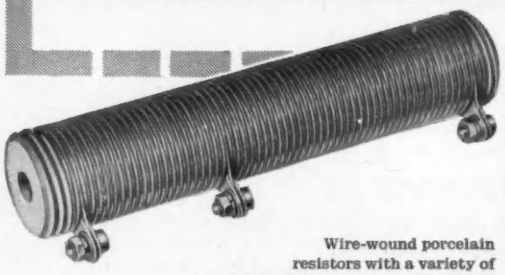

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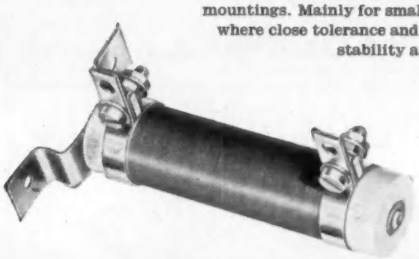

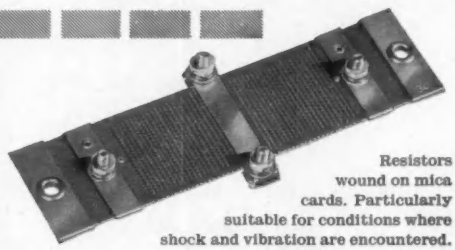

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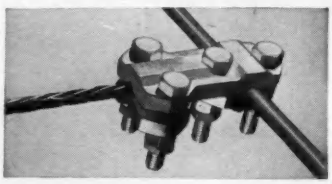

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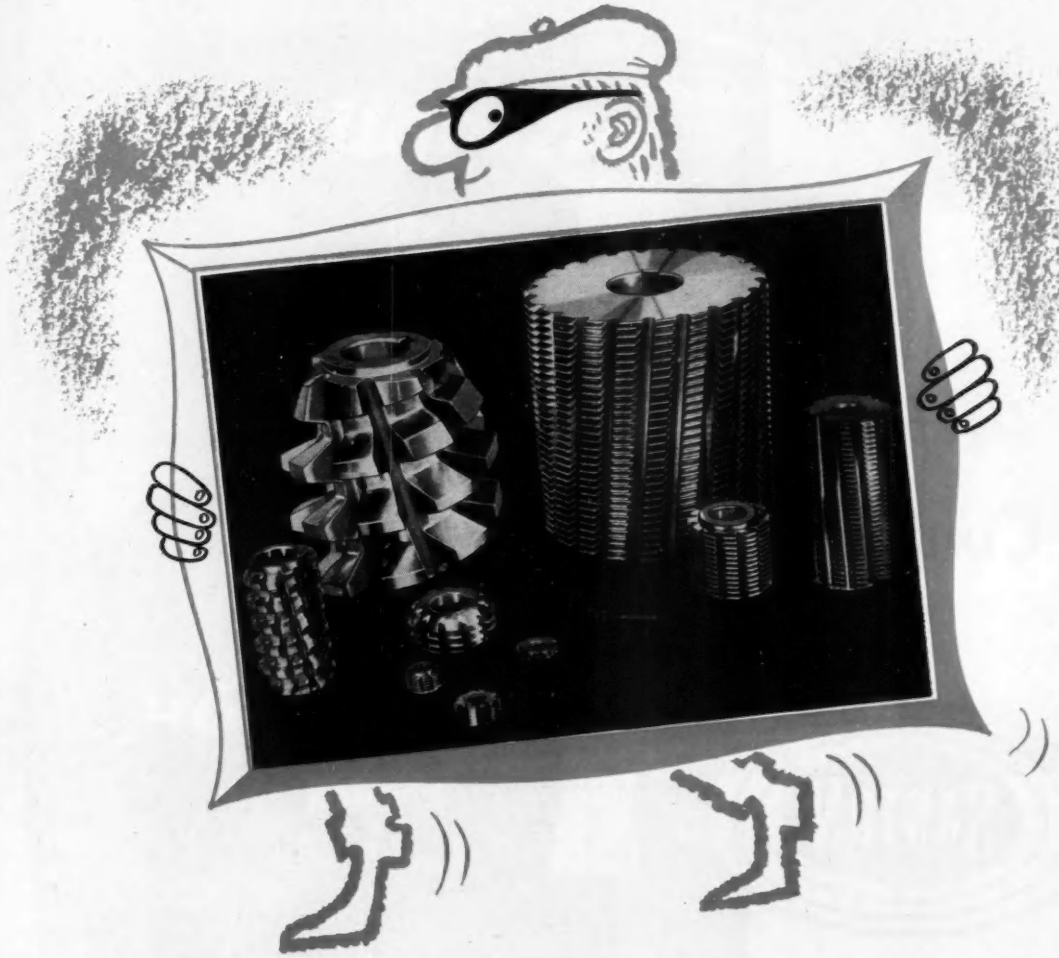

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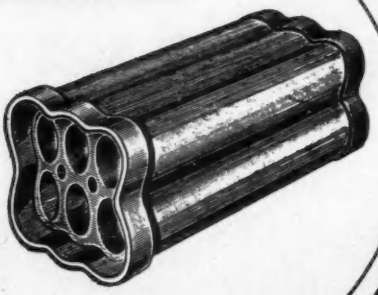

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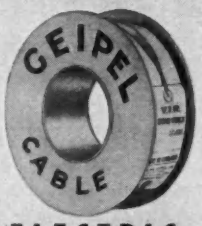

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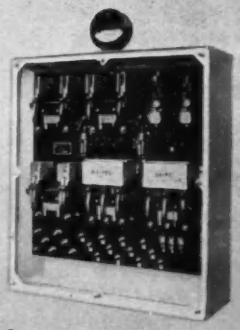

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BACKPLATES. I.E.E. Reg. 207G. Backplates are supplied with the surface units, unless order states not required. Surface unit prices then 1/- doz. less.

FUSED PLUGS. Are not included in the price table shown. Cat. Nos. PG 13 Brown 39/- doz., PG 14 Cream 43/- doz., PG 15 Black, High Impact, 49/- doz. Each includes 13 Amp. Fuse-link as standard.

CARTRIDGE FUSE-LINKS. B.S. 1362. 13 Amp. Brown, 10 Amp. Yellow, 5 Amp. Grey, 2 Amp. Blue. All 7/- doz.

SOCKET-OUTLETS				SWITCHSOCKET-OUTLETS	
Cat. No.	Price Doz.	Mounting	Colour	Cat. No.	Price Doz.
SK 31	46/-	Surface	Brown	SS 31	72/-
SK 32	52/-	Surface	Cream	SS 32	78/-
SK 35	44/-	Flush	Brown	SS 35	70/-
SK 36	50/-	Flush	Cream	SS 36	76/-

Ashley REGD.

ASHLEY ACCESSORIES LIMITED, ULVERSTON LANCASHIRE

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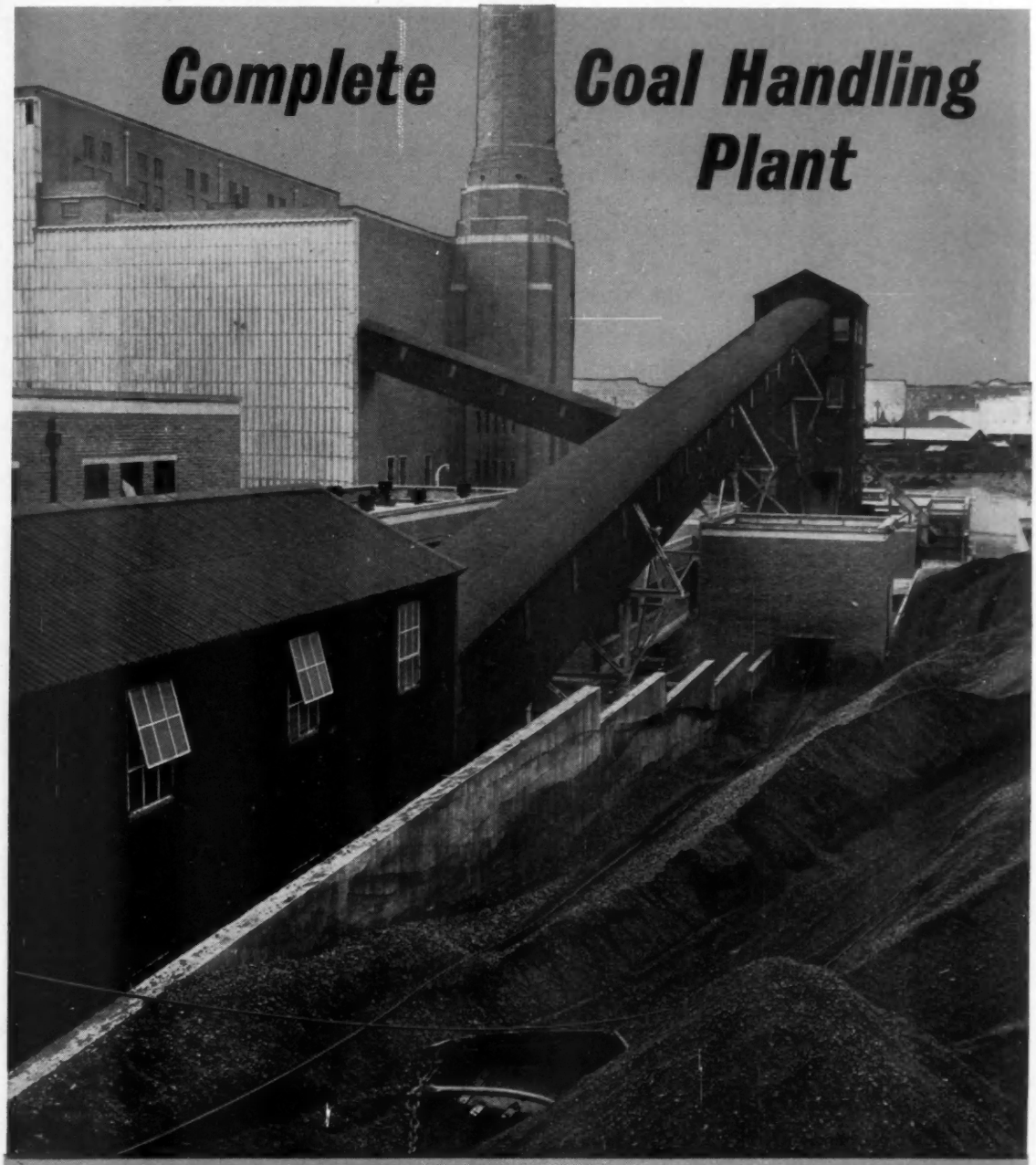
MEMBER OF THE ASHLEY GROUP

AY 101



IC

Belt conveyors, transporters, bucket elevators, ash handling plant, gravity bucket conveyors, BEAUMONT skip hoists, drag scraper plant

INTERNATIONAL COMBUSTION PRODUCTS LIMITED

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TGA MH 16C

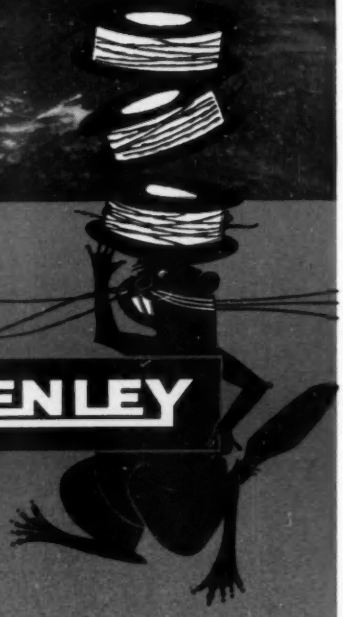
Critical moment, this, *when brain and sinew must work as one to get the most out of the wind! Fast, co-ordinated action is the essence of successful racing sailing—and the secret of the success of Henley service. If you want wiring cables . . . and you want* **action** *. . . you want Henley's!*

Photograph by courtesy of Beken & Son

IF IT'S *Action* YOU'RE AFTER

CALL **HENLEY**

A Nation-wide network of 28 Henley Branches brings you the cables you want . . . where you want them . . . when you want them.



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V.R. Braided and Compounded
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Flexible Cords—Rubber and Plastic

These are but a few of the very wide range of cables and wires we manufacture to cover every electrical need.

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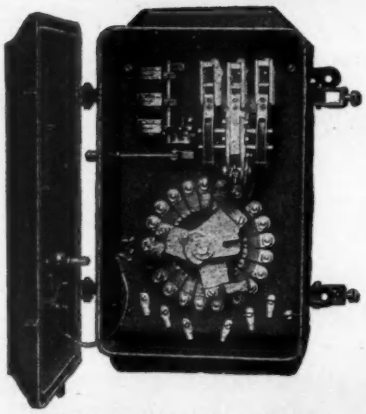
On your marks . . .

Get set . . . and you're off
. . . no false starts, no failures
. . . a perfectly smooth automatic
starting everytime if you instal one of our
standard A.C. or D.C. Starters.



Hand Operated Stator-Rotor Starter
30 h.p. 400/440 volts, 3-phase, 50 cycles A.C.

MOTOR CONTROL GEAR

To BS.587/57

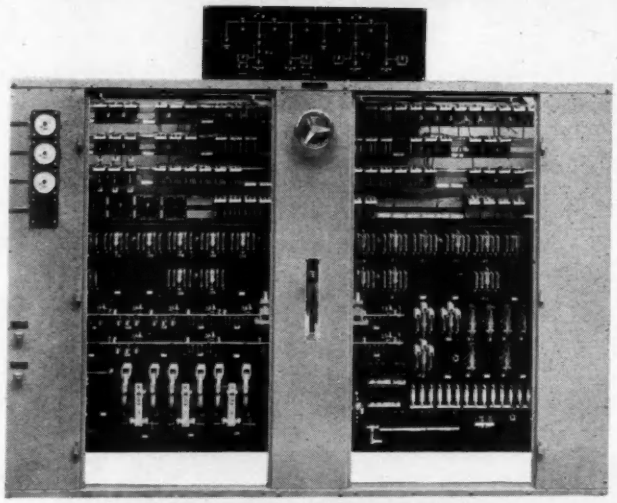
We are well known for the manufacture of Contactors and D.C. Marine Control gear but we also have a range of standard Industrial A.C. and D.C. Starters.

Our industrial Range covers :—

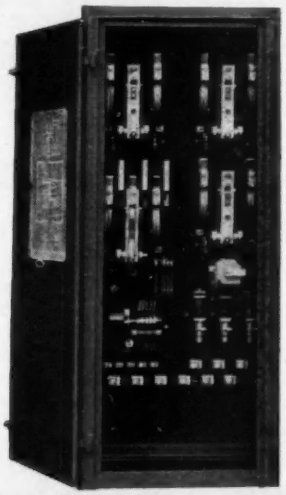
A.C. Direct-on-line Starters.
Automatic Star-Delta Starters.
Hand Operated Stator-Rotor Starters.
Automatic Stator-Rotor Starters.

D.C. Hand Operated Starters.
Automatic Step Starters.

All starters are available with or without isolators and with either magnetic or thermal overload relays as preferred.
In addition to the standard range of control gear, we manufacture special control panels, and cubicles to customers' particular requirements.



A multi-motor control cubicle for automatic control of a printing press



Automatic 4-Step Stator-Rotor Starter
40 h.p. 400/440 volts, 3-phase, 50 cycles A.C.

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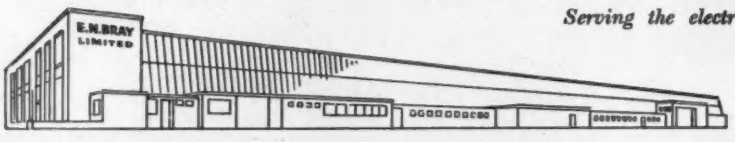
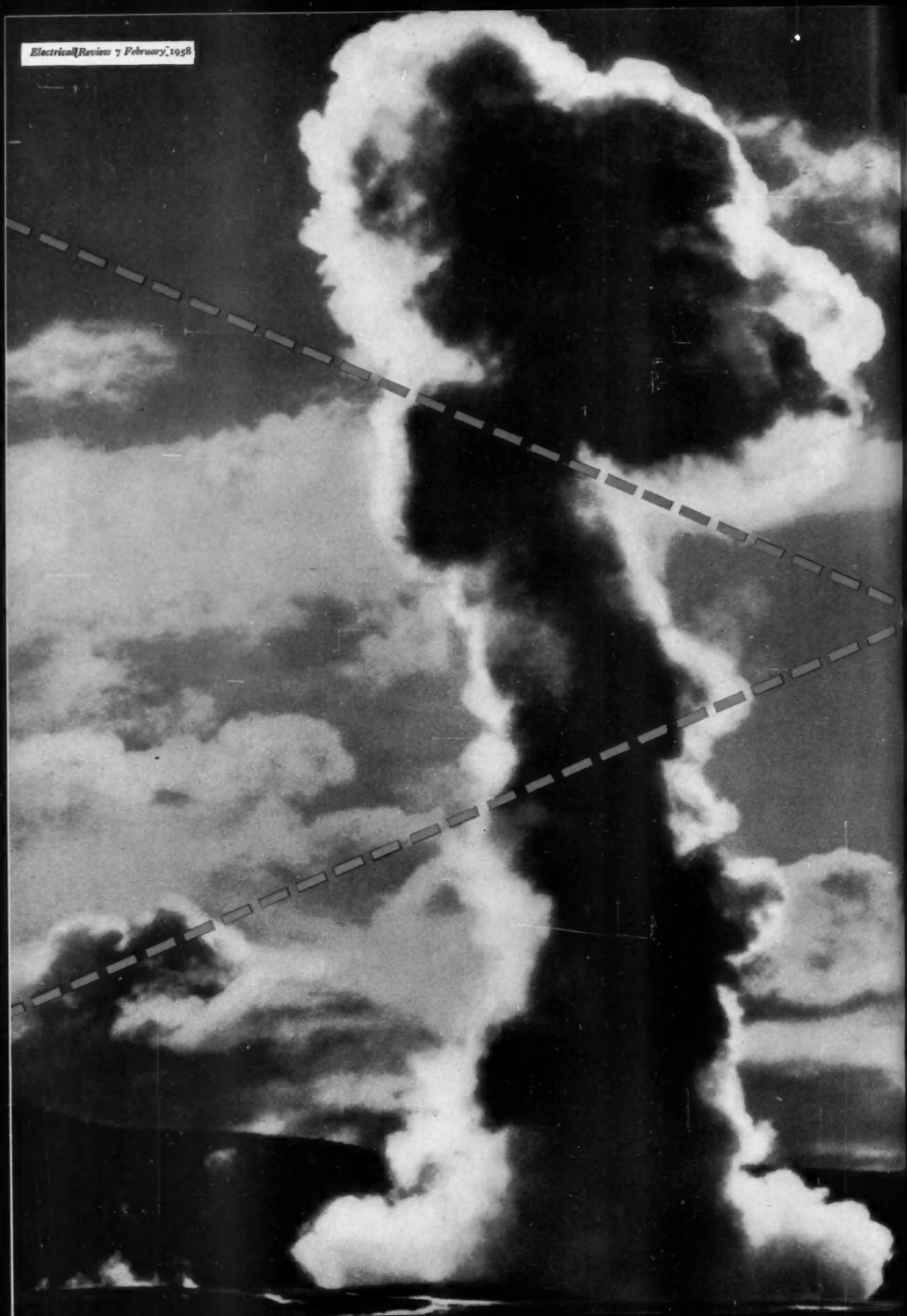
Control Gear Works, Britannia Road, Waltham Cross, Herts. Telephone: Waltham Cross 2212/3/4/5

Serving the electrical industry for more than 30 years





raw power—refined control

Old Faithful, most famous of the geysers at Yellowstone Park. Such phenomena are within the scope of the observations of scientists of more than 50 nations throughout the International Geophysical Year. Photograph by courtesy of United States Information Service

one side of the picture— the raw, natural power; unharnessed, uncontrolled

and the other side? Simplex switchgear. Reliable and protective. The means by which raw power is controlled, directed, channelled. An ideal means, because Simplex take a workmanlike view of switchgear: use the best of the most suitable materials and methods. Produce a job that looks as good as it is. And above all — Simplex design for the man on the job — plan for utmost ease in installation, maintenance and adaption

Simplex Switchboard designed to the requirements of the Chief Engineer, Ministry of Works for the Atomic Research Establishment at Harwell. Installed in the form of a curve to fit inside the outer steel shell of reactor 'Pluto', this switchgear controls the main auxiliary circuits associated with the reactor

it's the installed cost that counts!

cut costs and specify

switch and fuse gear by

Simplex

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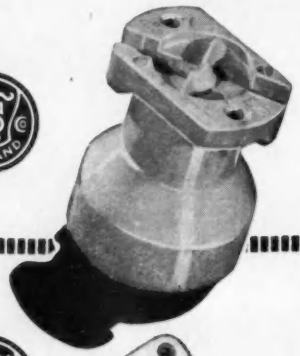
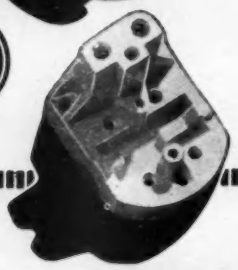
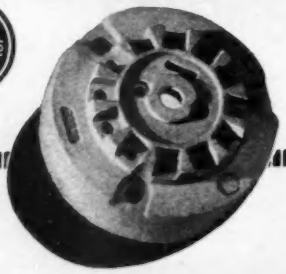


porcelain



die-pressed

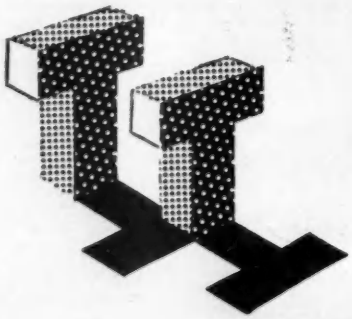


insulators

Our long experience as manufacturers of die-pressed porcelains for all electrical accessories is at your service.

The 'T.T.' Trade mark is a safeguard of good quality for all electro-ceramics, whether H.V. or L.V. insulators, refractories for electrical heating elements, H.F. ceramics etc., etc.

We would also remind you that "FISH SPINE" insulating beads are still the highest quality and most accurate beads available.



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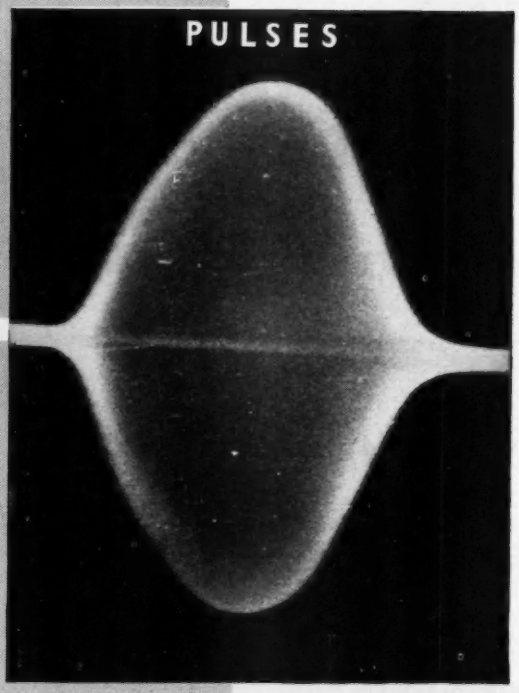
J3800

Fourier analysis of Waveforms



A Radar Pulse shown on a Cathode Ray Tube Screen

One of the many programmes for the Pegasus digital computer, made available through the Ferranti Computing Service, evaluates the Fourier coefficients of a periodic function. Any precision, up to the 200th harmonic, may be obtained.

- ★ You have the data.
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a HEATED Spin Dryer..

greatest development since spin drying began

Like all spin dryers, the Thermair spins excess moisture from the washing.

Unlike other spin dryers, the Thermair also circulates heated air through the washing, drying it *really* ready for ironing—drying it ready for use if desired.

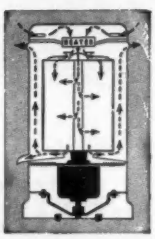
First with heat, the Thermair sets the pattern for spin dryers of the future. To get clothes really dry you need a Thermair.

The Thermair is quiet and stable, because of an entirely new principle—gyroscopic centring. It's capacious, because you can fill it to the top, packing in about 25% more washing than with most. It's safe, because the clothes are totally enclosed and the spinner automatically brakes when the lid is raised.

The Thermair, retailing at 43 *guineas, including Purchase Tax, is going to mean big business for you. We are telling house-wives that they can pick the rainiest day to do their washing—that the Thermair brings sunshine and a good drying breeze right into the kitchen, whatever the weather. No more wringing, no more broken buttons, no more pegging out, no more weather worries. That, you'll agree, is a good* 43 *guineas worth. The first spin dryer with heat is going to sweep the market. May we suggest you send for more details before the demand builds up ?*

Thermair

FIRST WITH HEAT SPIN DRYER



See how the air is first warmed, then circulated through the spinning clothes to make them really dry.

(Patents applied for).

MANUFACTURED BY THERMAIR DOMESTIC APPLIANCES LIMITED
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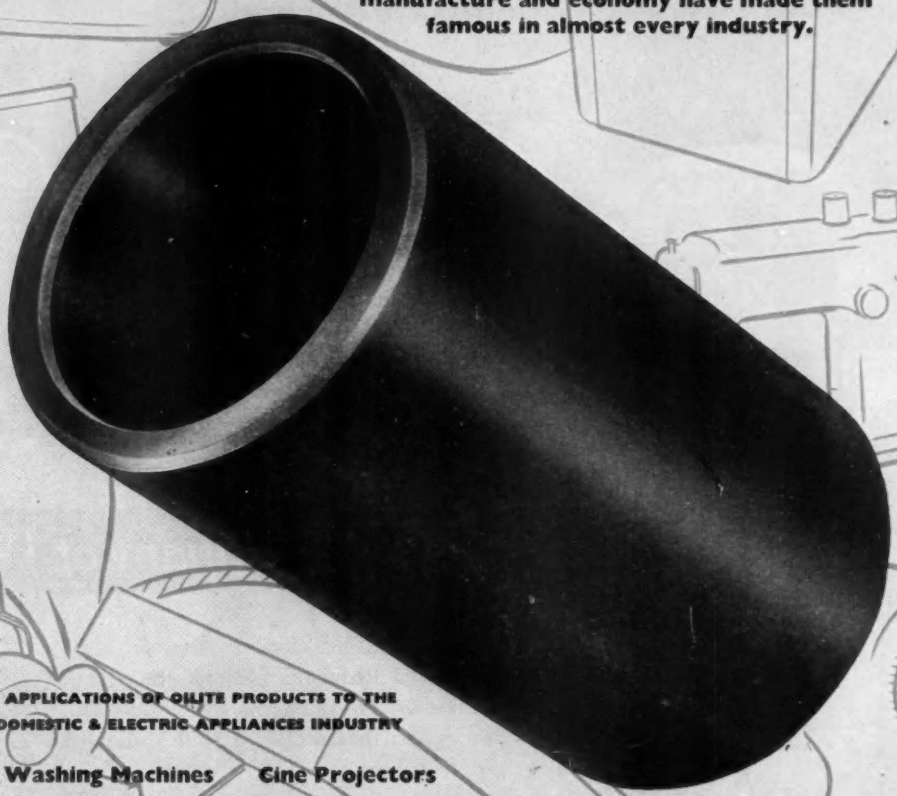
Silence in the operation of domestic appliances is a golden selling point. "Oilite" self-lubricating bearings provide an ever-present oil cushion between shaft and bearing surface—a unique feature playing an important part in noise reduction. The outstanding wear-resistant qualities of "Oilite", their precision manufacture and economy have made them famous in almost every industry.



APPLICATIONS OF OILITE PRODUCTS TO THE DOMESTIC & ELECTRIC APPLIANCES INDUSTRY

Washing Machines — Cine Projectors
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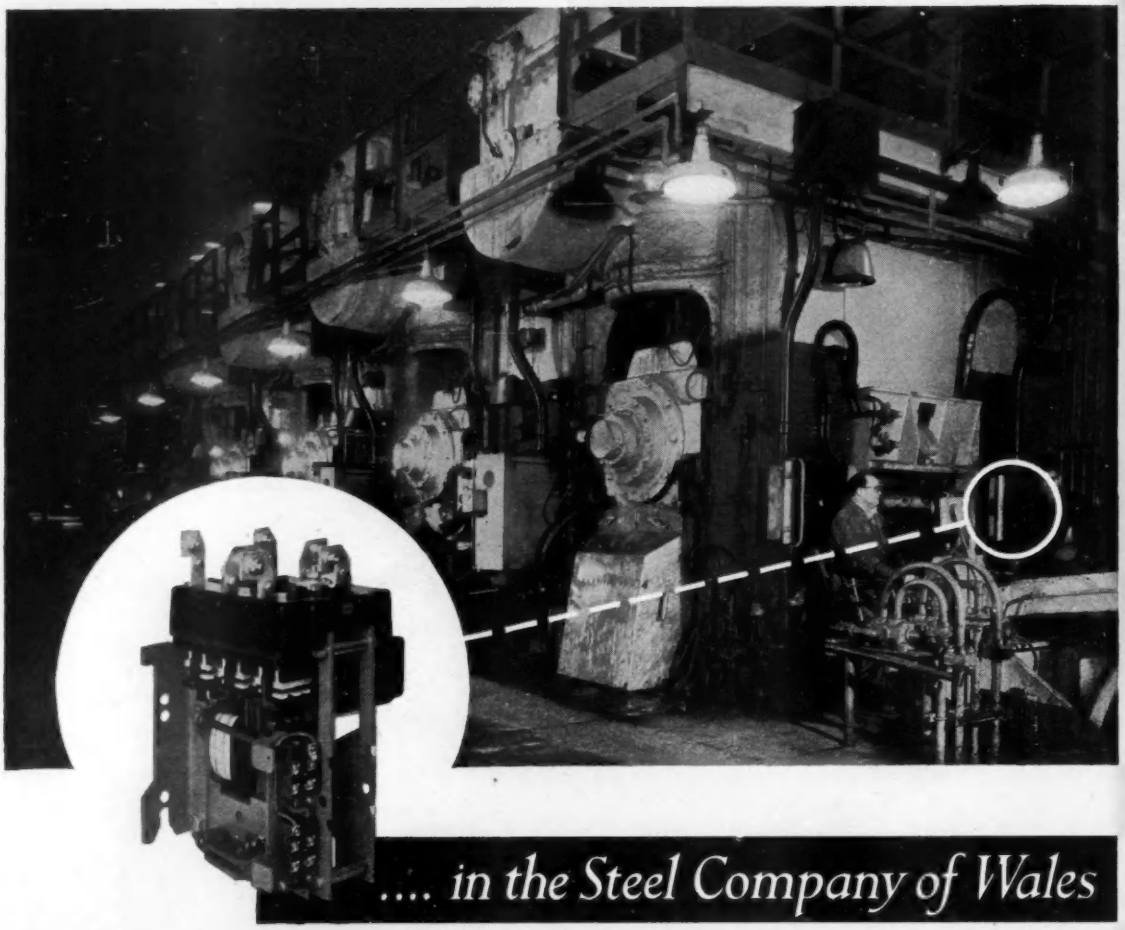
THE MANGANESE BRONZE & BRASS COMPANY LIMITED

KLÖCKNER MOELLER *Switchgear . . . .*



.... *in the Steel Company of Wales*

In September, 1954, a Klöckner Moeller contactor was installed in the Cold Reduction plant of the Steel Company of Wales' Trostre works.
Now, some 3 years later, the contacts have 1.3 mm and 1.1 mm of wear remaining. The expected life of these contacts is a further 6 years.
In addition, during the entire working life of this equipment it has not been necessary to carry out any maintenance or repair.

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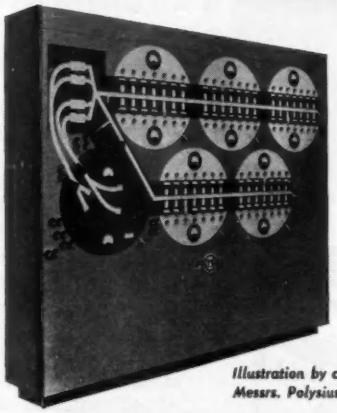

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Tailor made to YOUR specification or engineered and designed for YOU

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The mark of the Specialists

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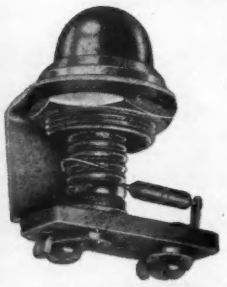
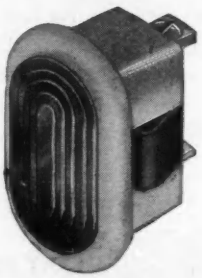


S.L.125

S.L.90/N



S.L.50

S.L.81

S.L.78

S.L.78: Designed to be the smallest possible and lowest cost mains signal lamp. Single $\frac{3}{8}$" hole fixing. S.L.81: $\frac{1}{2}$" hole fixing.

S.L.50: Snap-in fixing. S.L.90/N: Has replaceable MES neon tube. S.L.125: A new design similar to the S.L.90/N but it has 5 BA screw terminals and built-in resistor.

- Models for all voltages from 80 to 600v AC/DC
- Colours: Red, Amber and Clear
- Neon tube will have very long life
- Many other models

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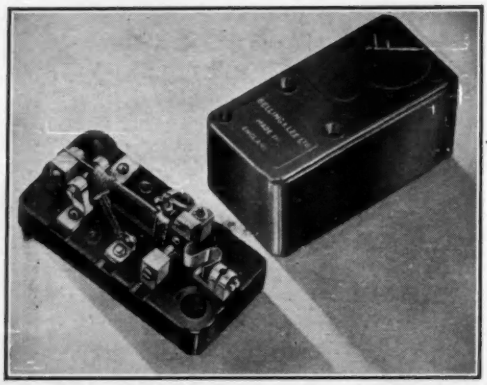


L.413
DELAY SWITCH
auto-resetting

"BELLING-LEE" *Thermal Switches*

These current-operated, bi-metal switches are designed for circuit protection and to control circuits requiring a particular time lag of operation. They are rated up to 5 amp. with contact voltages up to 250 volts A.C. They will trip currents of up to 20 amp. at 250 volts A.C., 5 amp. at 50 volts D.C., 2.5 amp. at 100 volts D.C. and 100 mA at 250 volts D.C.

L.415 is the hand resetting version. It is for use in circuits which should be remade at the discretion of the operator.

Normally open, normally closed or changeover contacts are available and the switches can be calibrated to individual requirements to a maximum time delay of 30-60 secs. Auxiliary contacts can be fitted to L.413 to "make" or "break" with main contacts. For L.415 these can be used for the "break" operation only. These switches are available with series, parallel or independent heaters rated up to 48 volts maximum.

Special thermal switches can be designed and manufactured to specific requirements where warranted.

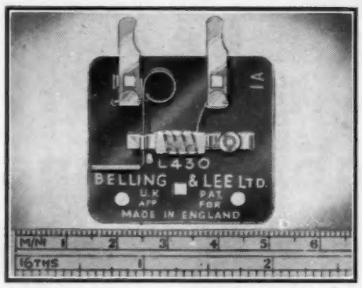
L.415
DELAY SWITCH
hand-resetting

"MINITRIP"

L.430 & L.430B

This simple, resettable cutout, designed primarily for overload protection in radio and television receivers has an almost infinite number of applications in the electrical and electronics fields, (e.g. small power tools, computer circuit protection, protection of automation equipment, etc.) It is especially valuable in cases where fire and safety regulations demand protection against harmless small overloads, and a traditional wire fuse sufficiently closely rated will not withstand normal switching surges.

The surge resistance is such that an overload of 40 times rated current for 0.02 seconds does not cause tripping, damage, or an alteration in characteristics.



Should a short-circuit produce an abnormally large sustained overload it is possible for the "Minitrip" to be destroyed, but protection is still given.

A "Minitrip" is cheaper than a fuse and fuseholder, and provides better protection characteristics.

RATINGS

100, 150, 200, 250, 300, 500 and 750 milliamperes, and 1 ampere.

Other ratings can be supplied to order up to 2 amperes.

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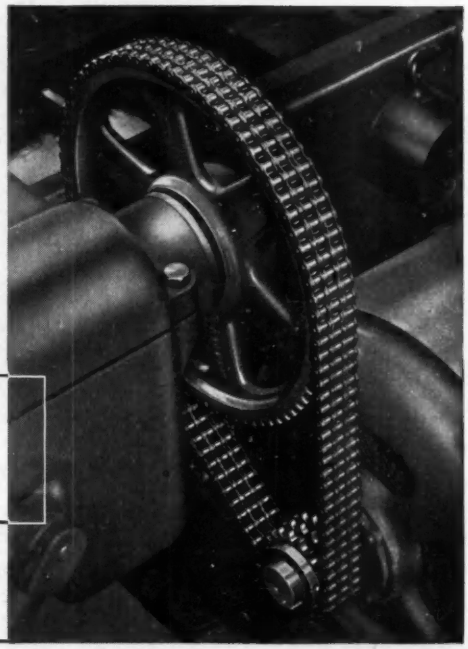
For conversions or new equipment specify **RENOLD stock chain drives.** Quiet, positive and smooth running, they will give you years of dependable, trouble-free service, outlasting other types of transmission many times.

Drives from fractional to 140 h.p. can be supplied **FROM STOCK** in 25 different ratios, easily selected from chart in our Catalogue Ref. 116/93



RENOLD STOCK CHAIN DRIVES

Only 17 in. centres could be allowed for this drive from motor to heavy lathe — and only a Renold stock chain drive could transmit the necessary power at such short centres.

RENOLD—*the FIRST name in precision chain*

RENOLD CHAINS LIMITED · MANCHESTER

FIRE ALARMS IN FACTORIES

3 DAYS' FREE TRIAL OFFER

THE FACTORY ACT 1937 SAYS—
In case of "fire," alarms must be sounded which will be clearly audible to every operative throughout the building.

★ **To all Factory owners, electrical contractors and others who have the responsibility to decide what type of alarm and how many we make the above offer of our "M" type siren.**

★ **This has been designed to "cut through" all noise levels in factories. These sirens can be supplied to work on any voltage AC or DC.**

★ **Easily portable (weight 4lbs.) and can be carried round to every department and plugged into any convenient lighting point so as to determine the number required for the whole factory.**

WAILERS: To produce the wailing note on the siren, a wailer can be supplied which can operate any number of sirens.
INDICATORS: Where it is desired to notify a central point where an alarm point has been operated we have electrically illuminated indicators. This, in addition to showing the position, will give an audible signal in any desired point, fire dept., engineers' office, etc. Fire calls can also be arranged to be transmitted direct to nearest Fire Station.
Our sirens, alarm pushes, and all our equipment are in accordance with the "British standards code of practice" and has the approval of Factory Inspectors.
INSTALLATION: We have representatives in all parts of the country who will call and advise you, and submit complete estimates. We will also on request send you full detailed diagrams to enable your own staff or local contractor to carry out the work.

Send today for list No. 59 and our offer of 3 days' Free Trial

CARTER & CO. (NELSON) LIMITED
WILLIAM STREET · NELSON · LANCASHIRE
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no worries after dark..

Lighting-up time presents no worries to progressive city and town authorities who have entrusted their street lighting and "off-peak" load control to the *Standard* D.C. Bias System. Simple and completely reliable, the D.C. Bias System is inexpensive, easy to install and maintain, and readily expanded to meet extensions in street lighting networks. Furthermore, the operating impulse cannot intrude into neighbouring areas. These are only some of the advantages of the *Standard* D.C. Bias remote control system. You can examine the technique in detail, and without obligation, by consulting S.T.C. The first move is to ask for brochure D/RC.6.

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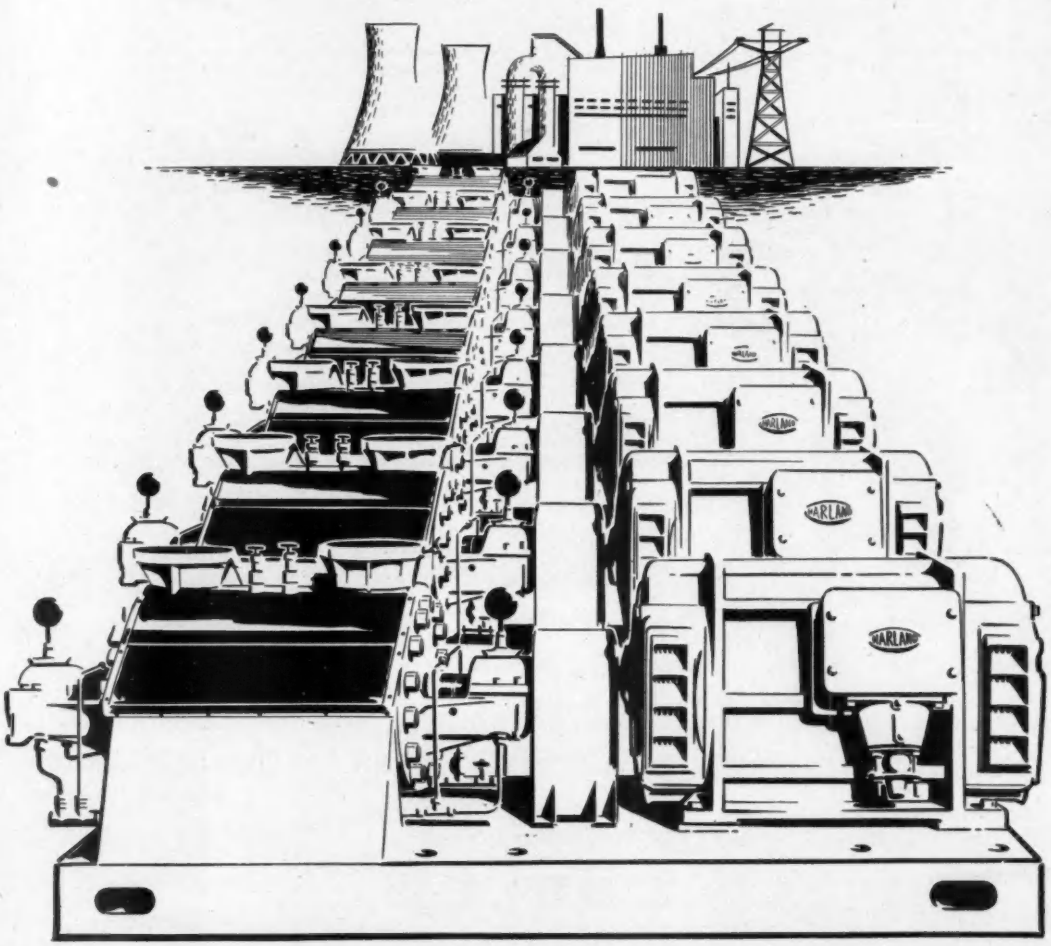
at

Bradwell

On behalf of the Nuclear Power Plant Company, Messrs. C. A. Parsons have placed with Harland the contract for 12 groups of boiler feed pumps complete with motors for this major nuclear power station to be commissioned by the Central Electricity Generating Board within their first Nuclear Power programme.



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LONDON & EXPORT SALES OFFICES: HARLAND HOUSE 20 PARK STREET W1

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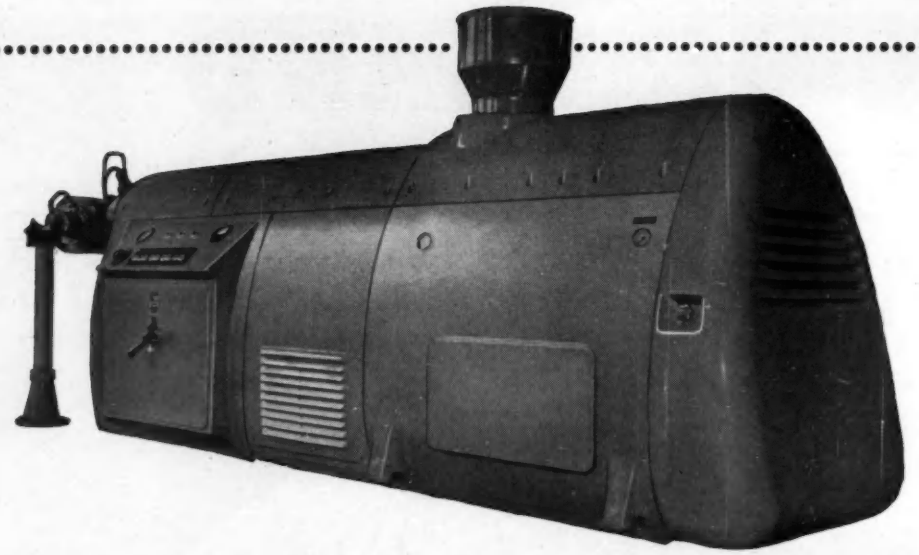
A.131/7



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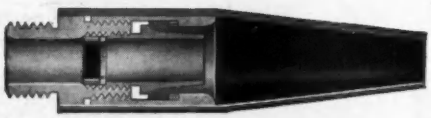
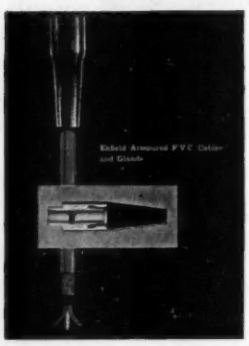
This is the machine we told you about in our last advertisement. It is the largest of our P.V.C. Extruders. We can now supply (almost immediately) P.V.C. sheathed cables of diameters less than ½" up to 4" and above. Deliveries can be made from stock for most requirements.

. . . and Glands



. . . . too are available. Specially designed to simplify P.V.C. Cable terminations. They have already proved their usefulness in many installations.

This folder will tell you all about "Enfield Armoured P.V.C. Cables . . . and Glands". Write for it now.



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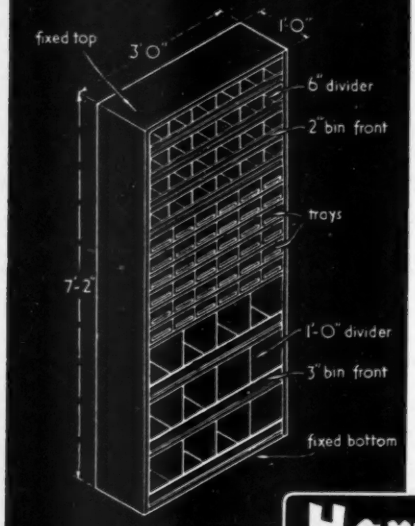
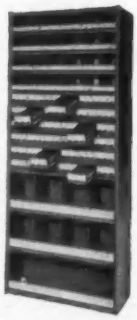
for small articles





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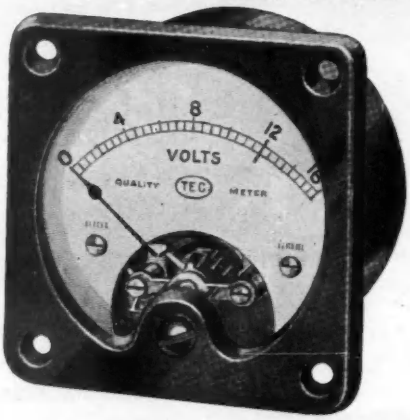

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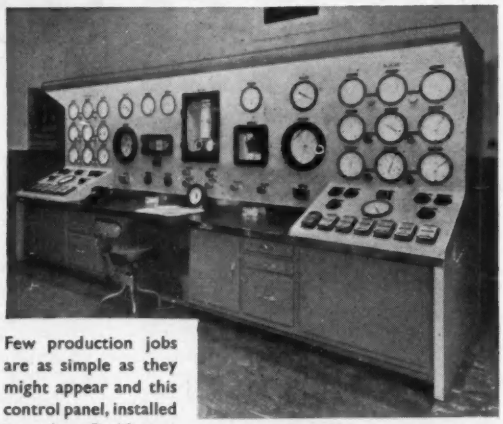

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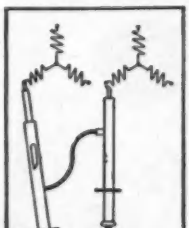

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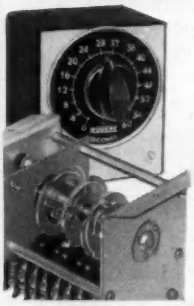

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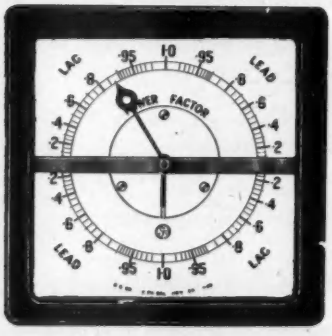

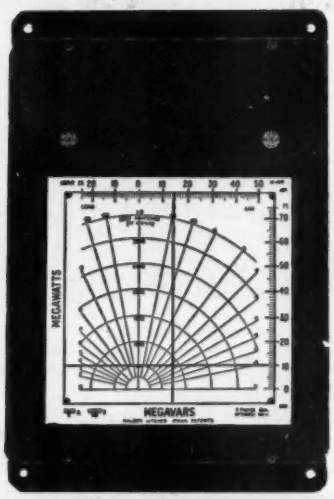

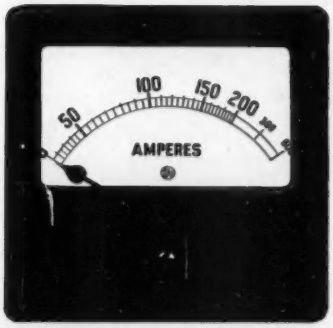

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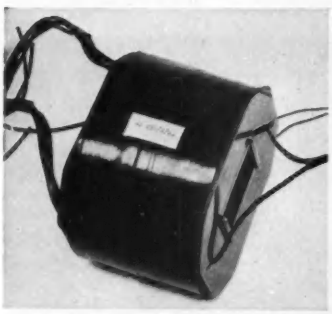
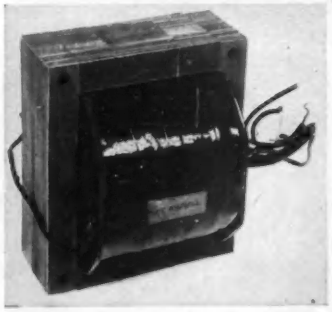
(said Timothy Tapir)

Tim Tapirs long enquiring snout
As Tapirologists agree
Is not designed to root about
The realms of 'electricitee'





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Where Ohm's law is applicable
Use DILEC Tape for Tapir's sake
And make him more amicable.

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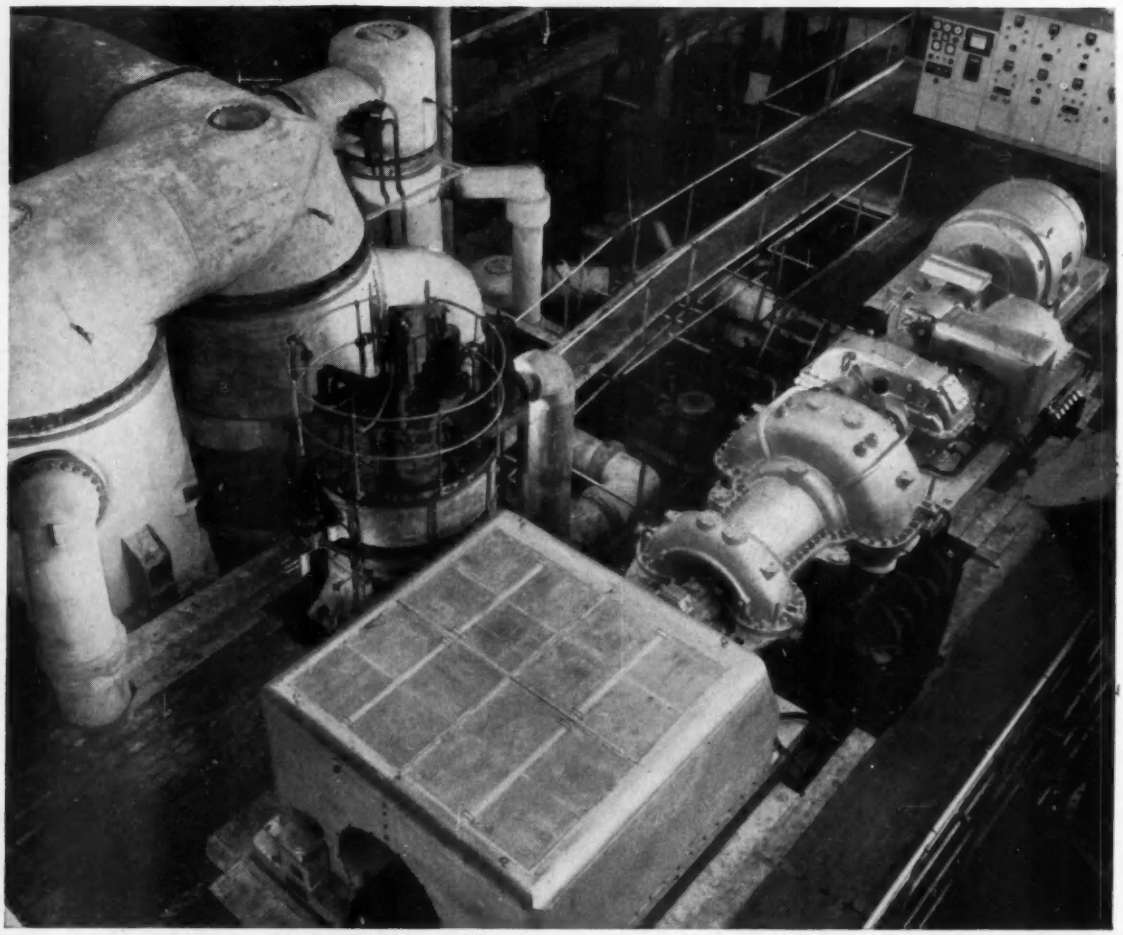

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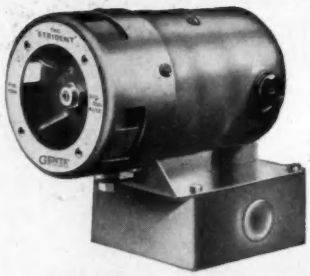
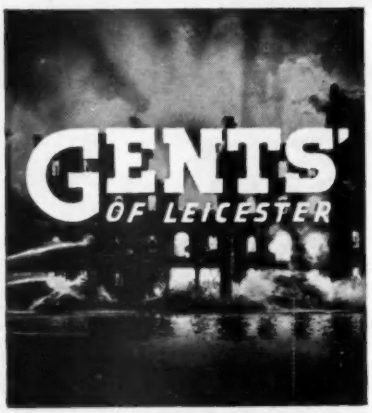


The "STRIDENT" Syren

Alarms



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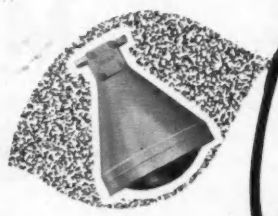

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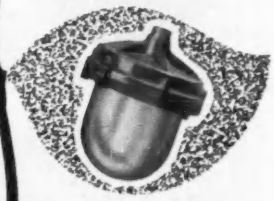

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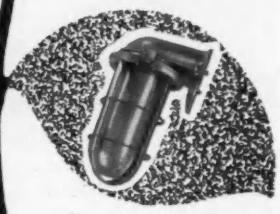
Victor



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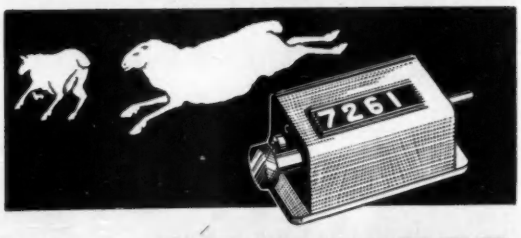

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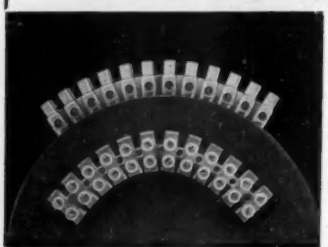

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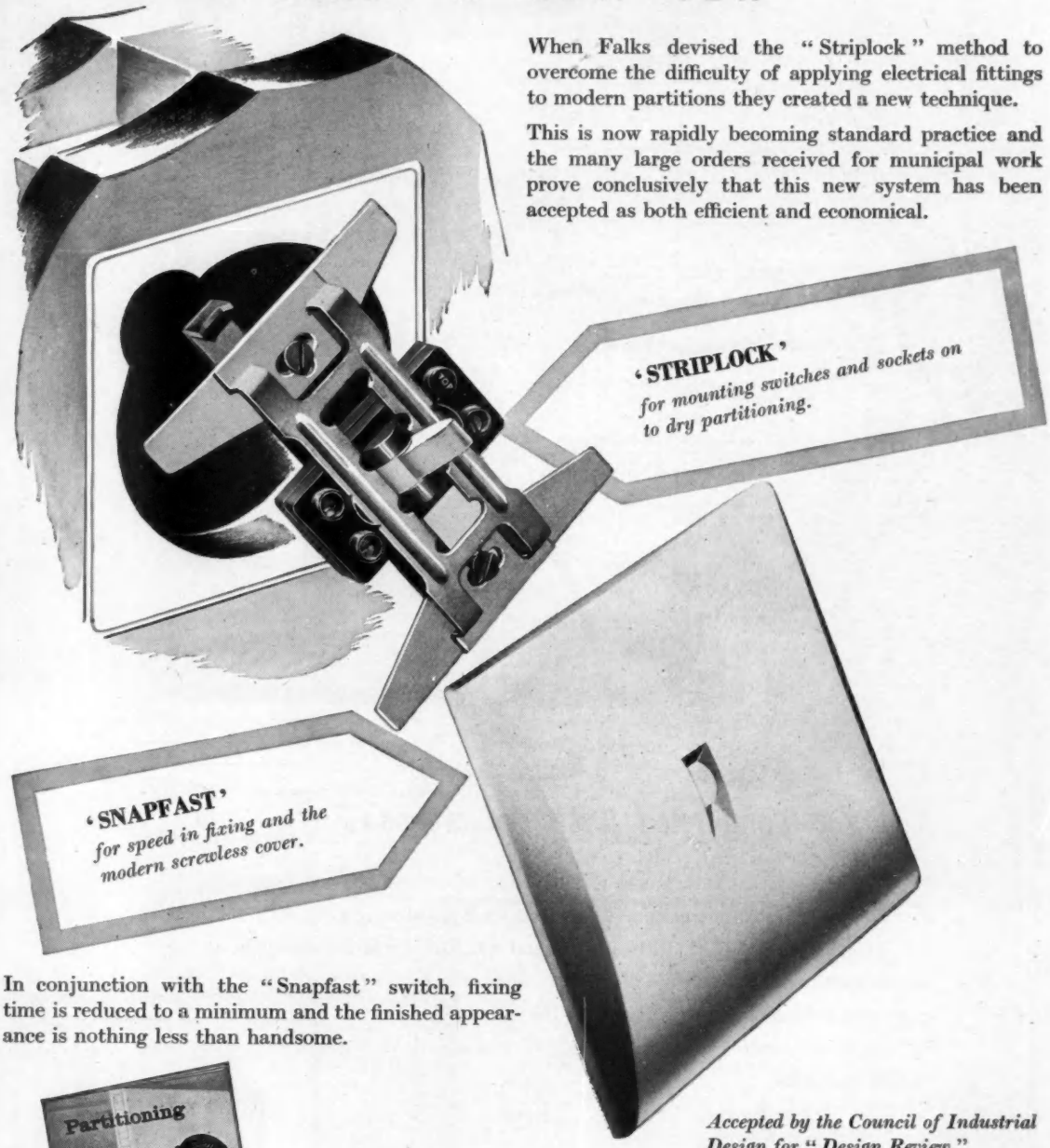
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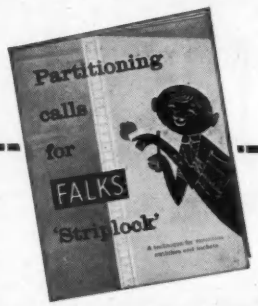

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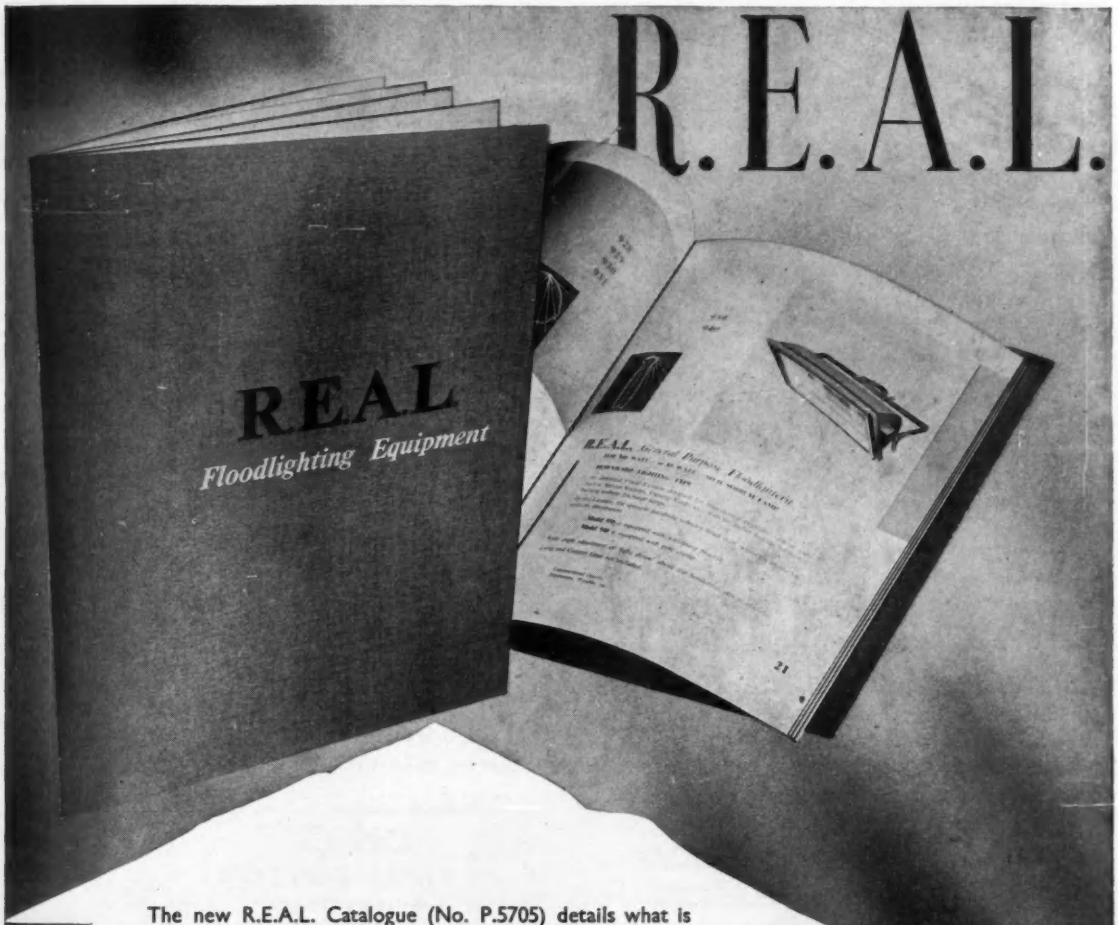

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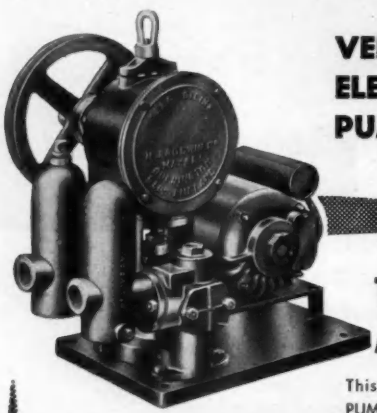

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for remote control of starters, etc.

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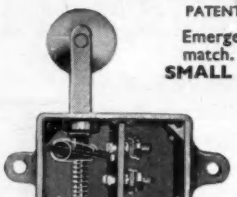

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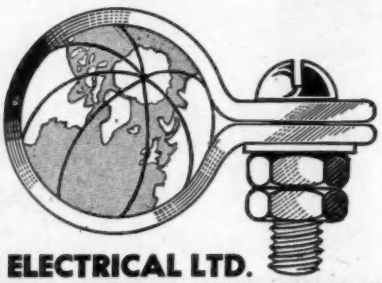

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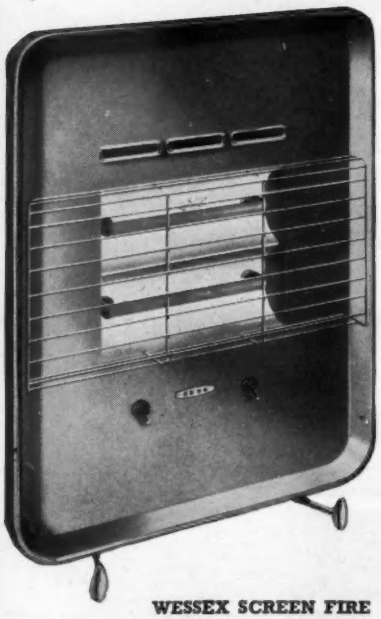

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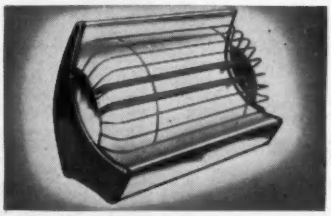
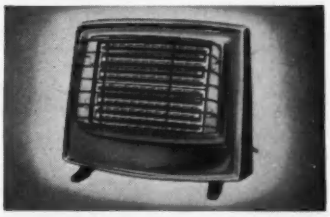
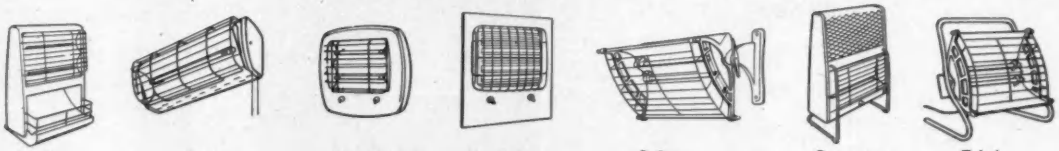


CRESCENT. Delightfully shaped model in enamelled sheet steel with electro-brightened anodised reflector, plated guard and pencil type elements 1 kw. or 2 kw. Colours: Welsh Grey, Cotswold Stone, Pale Gold, Gay Red.



SOMERSET. A fire with superb finish and sound construction. Gleaming vitreous enamel finish with plated guard and block type elements. 1 k.w. or 2 k.w. Colours: Oyster Grey, Guardsman Red, Citron Yellow, Willow Green.



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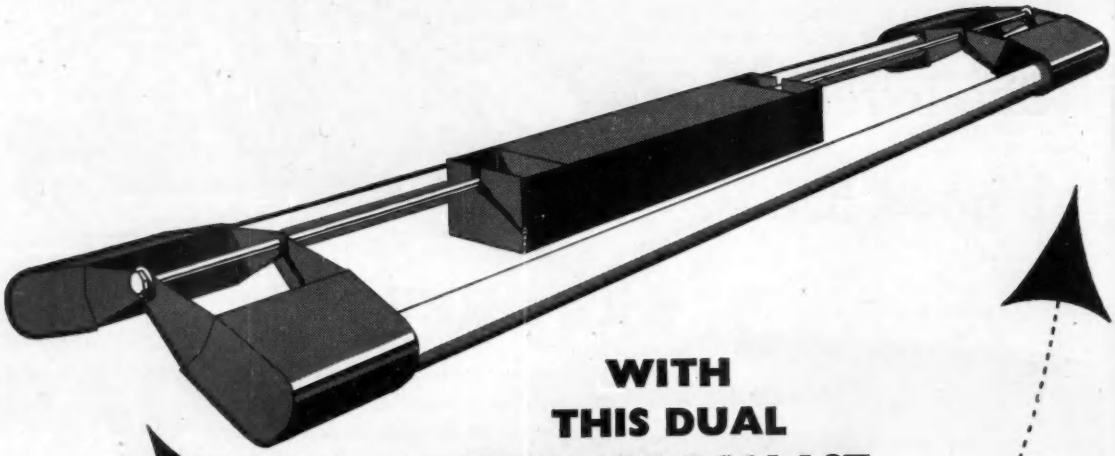
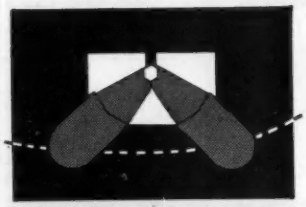
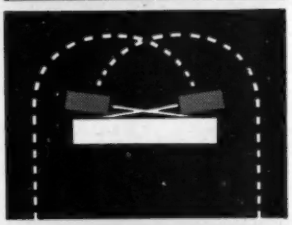


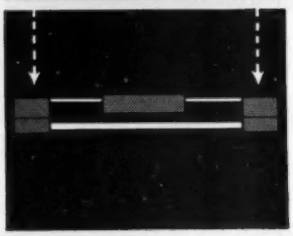
WITH THIS DUAL PURPOSE BALLAST UNIT EB2/80F



Tubes set at any desired angle for corner or angled mounting.



Tube holders folded on to case for easy handling and compact storage.



Unit fully extended, available in Red, Blue, Jasmine, White, Grey or Black.

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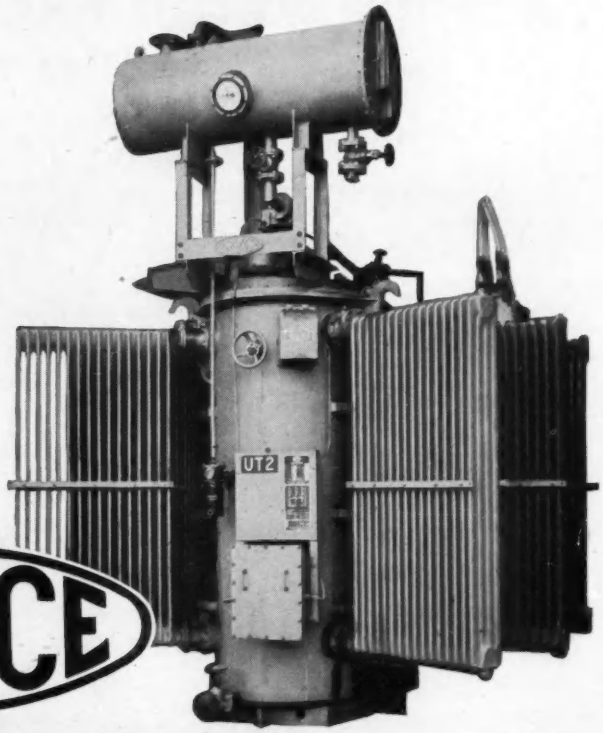
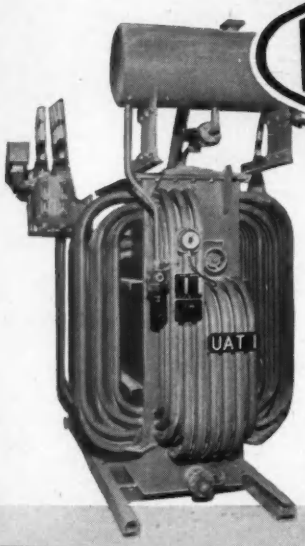
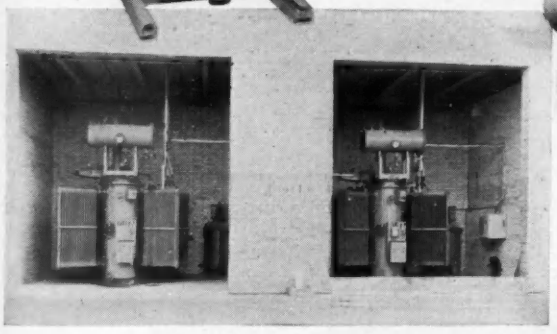


14 BRYCE Transformers

Ten of the fourteen Bryce Transformers for auxiliary services at the new Central Electricity Generating Board Power Station are now in service. They range from 5,000 kVA, 11,000/3,450 volts to 400 kVA, 3,300/433 volts.





The examples illustrated are (top right and bottom left) 5,000 kVA, 11,000/3,450 volts; (upper left) 1,000 kVA, 3,300/433 volts; and (bottom right) 400 kVA, 3,300/433 volts.

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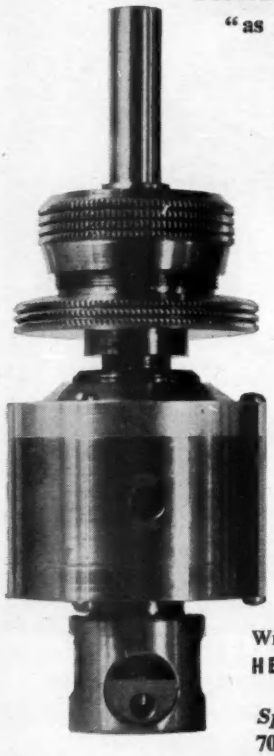

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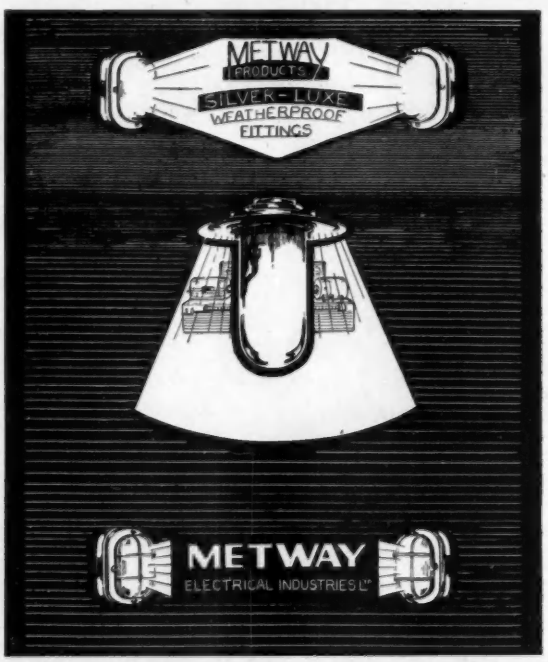

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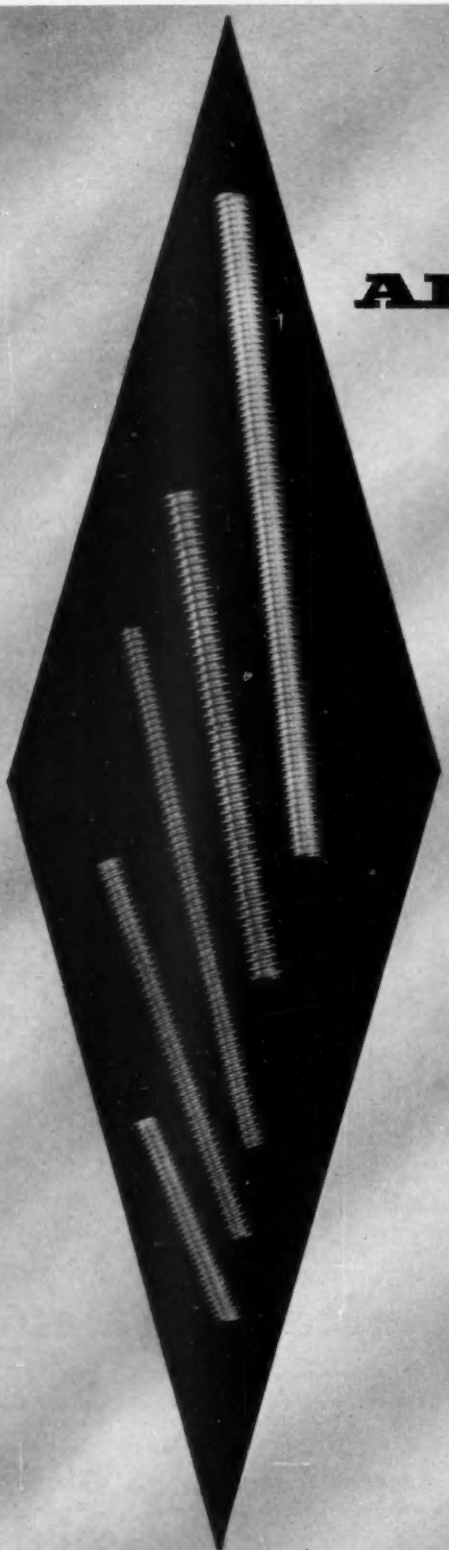

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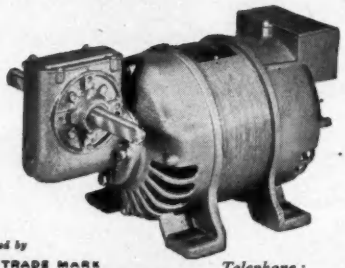

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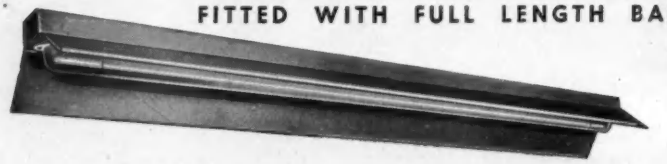

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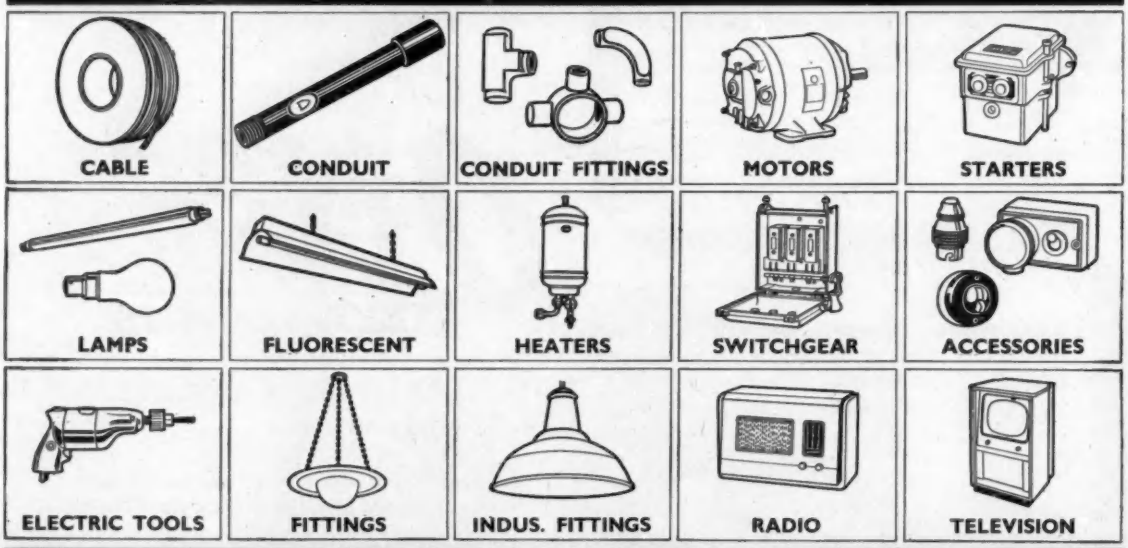

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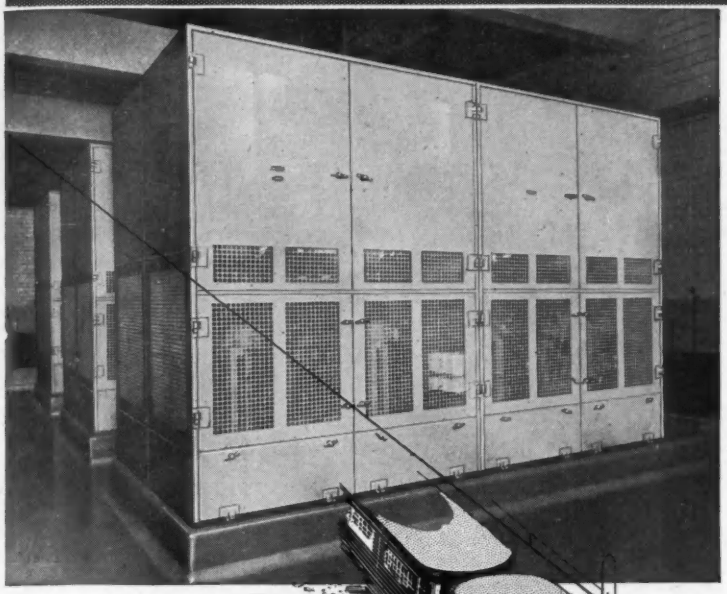

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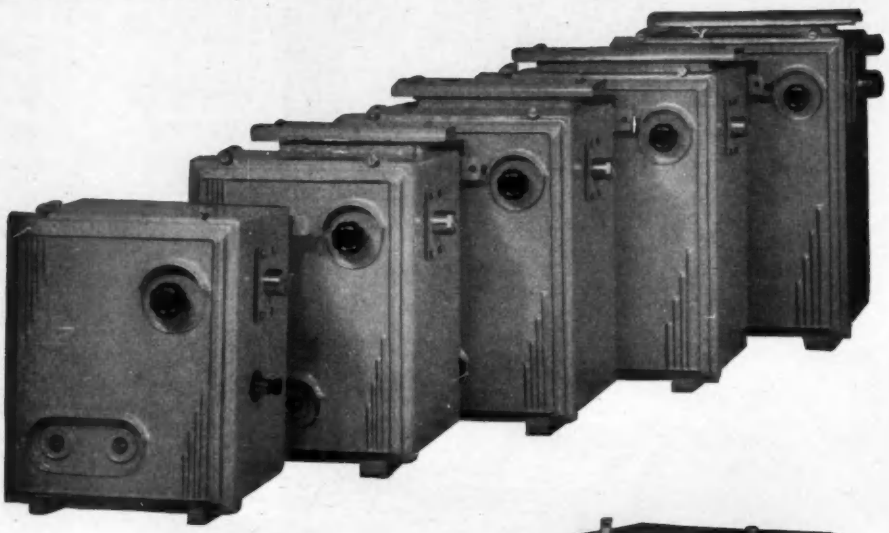
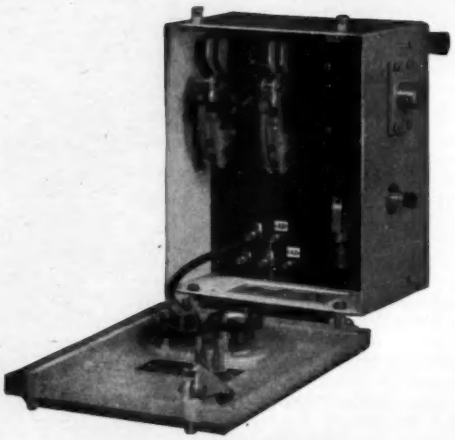
(UP TO 15 H.P.)





VARIETY OF CIRCUIT ARRANGEMENTS
EXCELLENT FINISH
RENEWABLE CONTACTS
INHERENT UNDER-VOLTAGE DISCRIMINATION
TIME LAGS DESIGNED FOR D.O.L. OR RESISTANCE START
YOUR CHOICE OF CABLE ENTRIES
SEND FOR LEAFLET No. 10755

VERITYS LTD. *Sales Headquarters:* PLUME STREET, ASTON, BIRMINGHAM 6
Branches: BRISTOL - GLASGOW - LEEDS - LIVERPOOL - LONDON - MANCHESTER - NEWCASTLE

CHADDERTON GENERATING STATION MANCHESTER

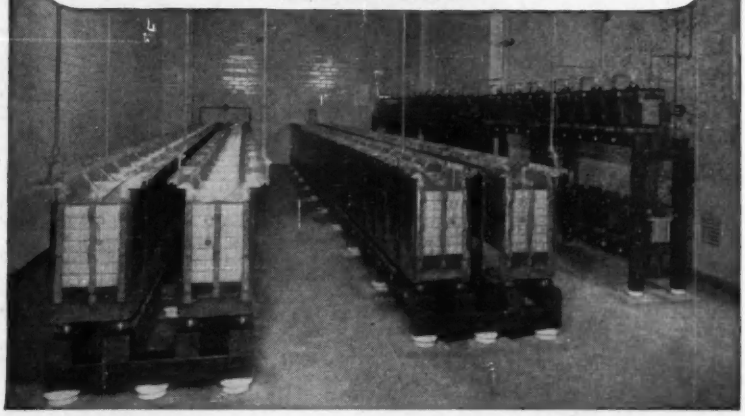


Illustration shows the installation of a 240 VOLT TUNGSTONE BATTERY Type B.S.S.D.11 500 A.H. and 2 Batteries of TUNGSTONE enclosed type, of 100 A.H. and 75 A.H. respectively at Chadderton Generating Station.

Photograph by permission of the British Electricity Authority.

Consulting Engineers: Messrs. Kennedy & Donkin.

TUNGSTONE BATTERIES have been designed to meet Post Office and British Standard Specifications. They are being used in Power Stations and Telephone Exchanges all over the British Isles; in Australia, India, New Zealand, West Indies, etc.

TUNGSTONE
STORAGE BATTERIES

TUNGSTONE PRODUCTS LIMITED
ST. BRIDE'S HOUSE, SALISBURY SQUARE, LONDON, E.C.4
Telephone: FLE 8011 *Works:* MARKET HARBOROUGH, LEICS.

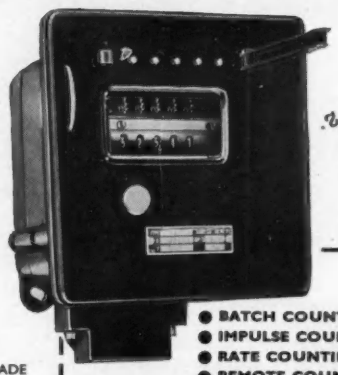
TRANSFORMERS
MANUFACTURED UP TO 500 K.V.A
FOR INDUSTRIAL AND DISTRIBUTION PURPOSES

Selenium Metal Rectifiers Manufactured Up to 30 K.W.

AUSTIN WALTERS & SON, LTD.,
TRANSFORMER DIVISION
AYRES ROAD, MANCHESTER, 16
Tel: TRAfford Park 1827

CW 3265

Automation
starts with counting



Batch Counting Unit with Automatic Reset

- BATCH COUNTING
- IMPULSE COUNTING
- RATE COUNTING
- REMOTE COUNTING

SWISS PRECISION MADE Manufactured by Société des Compteurs de Genève, Geneva, Switzerland

The SODECO range of impulse counters and impulsing units provide the basic components for automation of counting, batching, positioning and other manufacturing processes. *Let us advise you on your problems.*

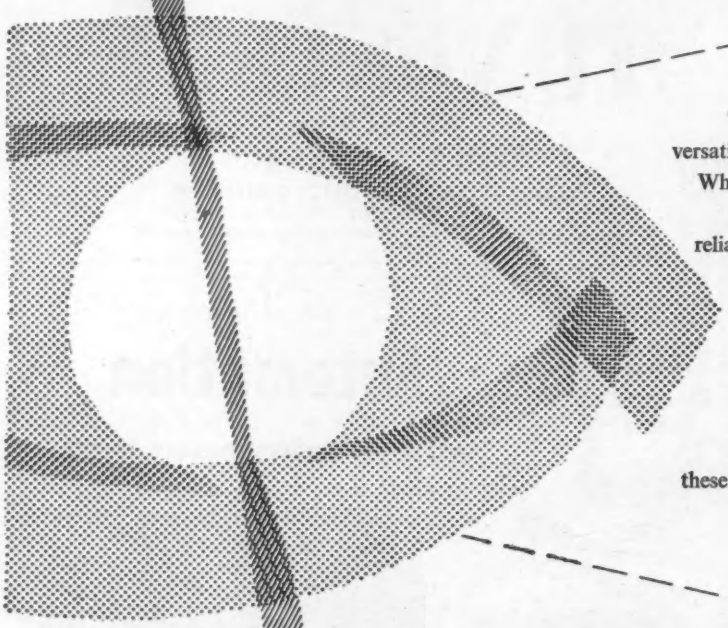
STONEBRIDGE CONTROLS & INSTRUMENTS
THE STONEBRIDGE ELECTRICAL CO. LTD.
6 Queen Anne's Gate · London S.W.1
Telephone: TRAfalgar 1444

counting, checking,

sorting, positional control,

process protection,

G.E.C. PHOTO-ELECTRONIC EQUIPMENT



The photocell is probably one of the most versatile electronic devices available to industry. When used in conjunction with a light source and a simple valve amplifier it provides a reliable and economical switch, which has the great advantage of not requiring physical contact for operation.

The applications are unlimited—why not consult the G.E.C.? A staff of specialist engineers is at your service . . . ready to advise you on these applications of photo-electric equipment.

A wide range of standard photo-electric equipments is available as stock lines, these include equipment for:—

Automatic Lighting Control
Accurate Indication and Recording of Smoke Emission
Infra-red Burglar Alarm Systems
Boiler or Furnace Flame Failure Indicators
Opening of Doors by Remote Control
Counting
Hopper Level Control
Photometric Purposes

Write for literature on G.E.C. photo-electric equipment to Valve and Electronics Department,

THE GENERAL ELECTRIC CO., LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

Craftsmanship in this Generation

We specialise in manufacturing Power Transformers for Generation, Transmission and Distribution. All YORKSHIRE Transformers are entirely constructed in our own works. We make Transformers to suit all requirements up to 60,000 kVA–132,000 volts

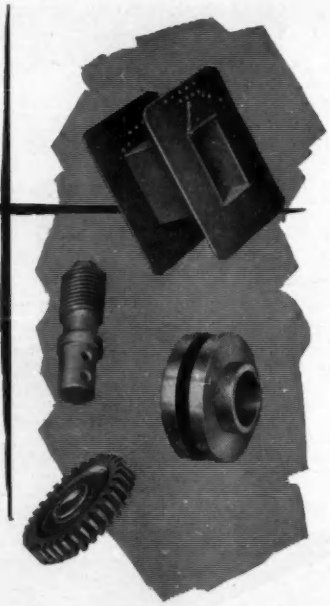
YORKSHIRE

ELECTRIC TRANSFORMER CO. LTD.
THORNHILL, DEWSBURY, YORKS

Telephone: DEWSBURY 1691-2

PIRTOID

SYNTHETIC RESIN BONDED LAMINATE



brings you
MATERIAL SOLUTIONS
to your
CURRENT PROBLEMS

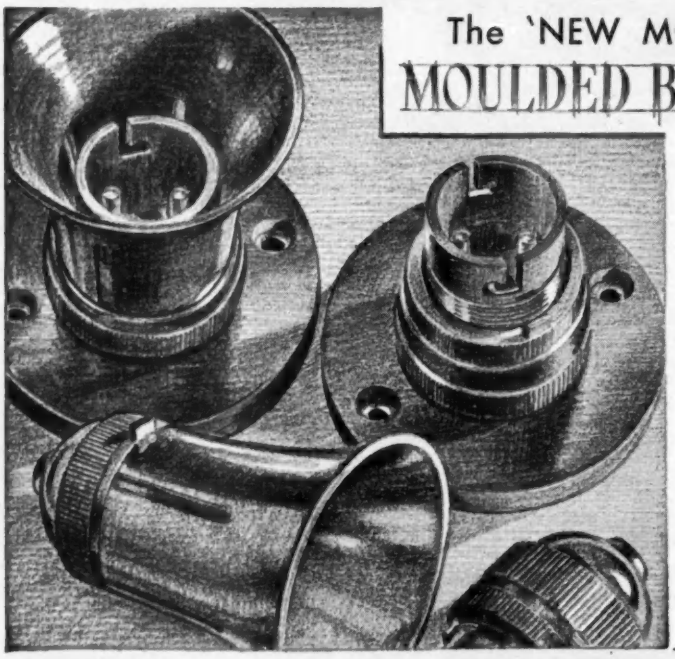
. . . because the range of PIRTOID Paper and Fabric base laminates affords all the machining qualities needed with consistent uniform dielectric and mechanised strength. Read this booklet, sent gladly on request.

H. CLARKE & CO. (MANCHESTER) LTD

Atlas Works · Patricroft · Manchester

Telephone Nos. ECCLES 5301-2-3-4-5

dmCK.4



The 'NEW MOORSOM' range of
MOULDED BAYONET HOLDERS

Available in flexible C.T.S., skirted, angle batten, shallow and deep batten types, complying with B.S.52.

This entirely new range of lampholders gives high quality at prices suitable for the most competitive lighting schemes.

Write for full details of this attractive lampholder range.

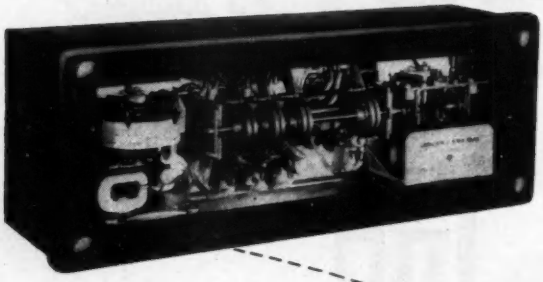
SPERRYN & CO. LTD., MOORSOM ST., BIRMINGHAM 6

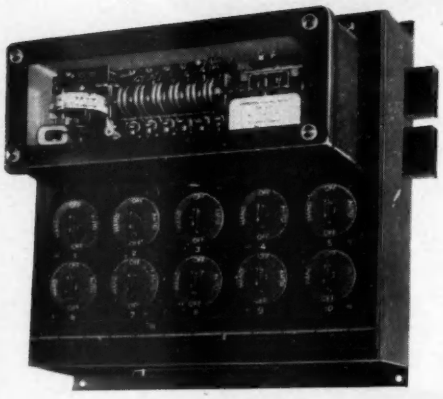
London Office: 23 Great Suffolk Street, S.E.1

Choose Metrovick relays and correct Power Factor AUTOMATICALLY

Type NJO4 relay for the control of single-step power capacitors.

A complete range of Metrovick relays is available for the control of capacitors as a means of improving the power-factor of industrial loads. Please write for full details.





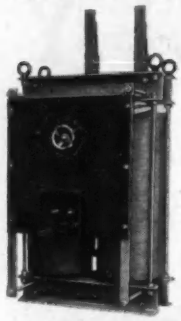
Type NJO3 relay for the control of a number of capacitors or capacitor sections in sequence. It may be switchboard or wall-mounting pattern with or without control switches.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

Andec LIMITED

TRANSFORMERS
LARGE OR SMALL



The illustration is of a 60 KVA Transformer with a 5,000 amp. Secondary, with tapped Primary to give secondary voltage variation from 12 volts to 4 volts. Primary tap changes are made with a rotary switch as shown. These Units are designed and tested to BSS 171 where applicable, or appropriate B.S. Specification.

This is a typical example of our "C" Core range. We manufacture both open and hermetically sealed types, wound to customers' specifications. This range extends from 10 VA to 1.6 KVA at frequencies up to 2,000 cps.

WHATEVER YOUR NEEDS — OUR TECHNICAL AND DESIGN DEPARTMENTS ARE AT YOUR SERVICE

ANDEC LIMITED

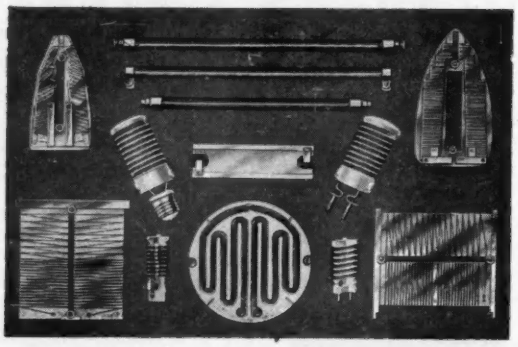
A.I.D., A.R.B. approved

BENNET ROAD • READING • BERKSHIRE

Tel. 82401/2

dependable
ELEMENTS
for every job

Stocked by Leading Wholesalers



THE
ELECTRIC ELEMENTS CO.
Tokenhouse Yard, Nottingham
Makers of Elements since 1921

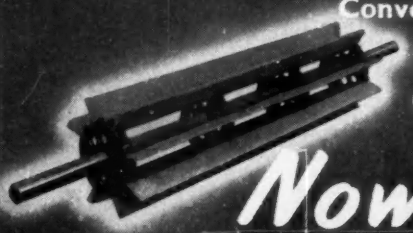
REGD

INSULATED WIRES
AND STRIPS

F. D. SIMS LIMITED
P.O. BOX 8, Hazelhurst Works
RAMSBOTTOM, Manchester
Telephone: Ramsbottom 2213/4/5
Telegrams: "SIMS" Ramsbottom
London Office and Stores:
106 Newlands Park, Sydenham, London, S.E.26
Telephone: SYDenham 4211/2

S42

The Famous Kez-Strip Conveyor Belt Brush



Now—
complete in combination with our

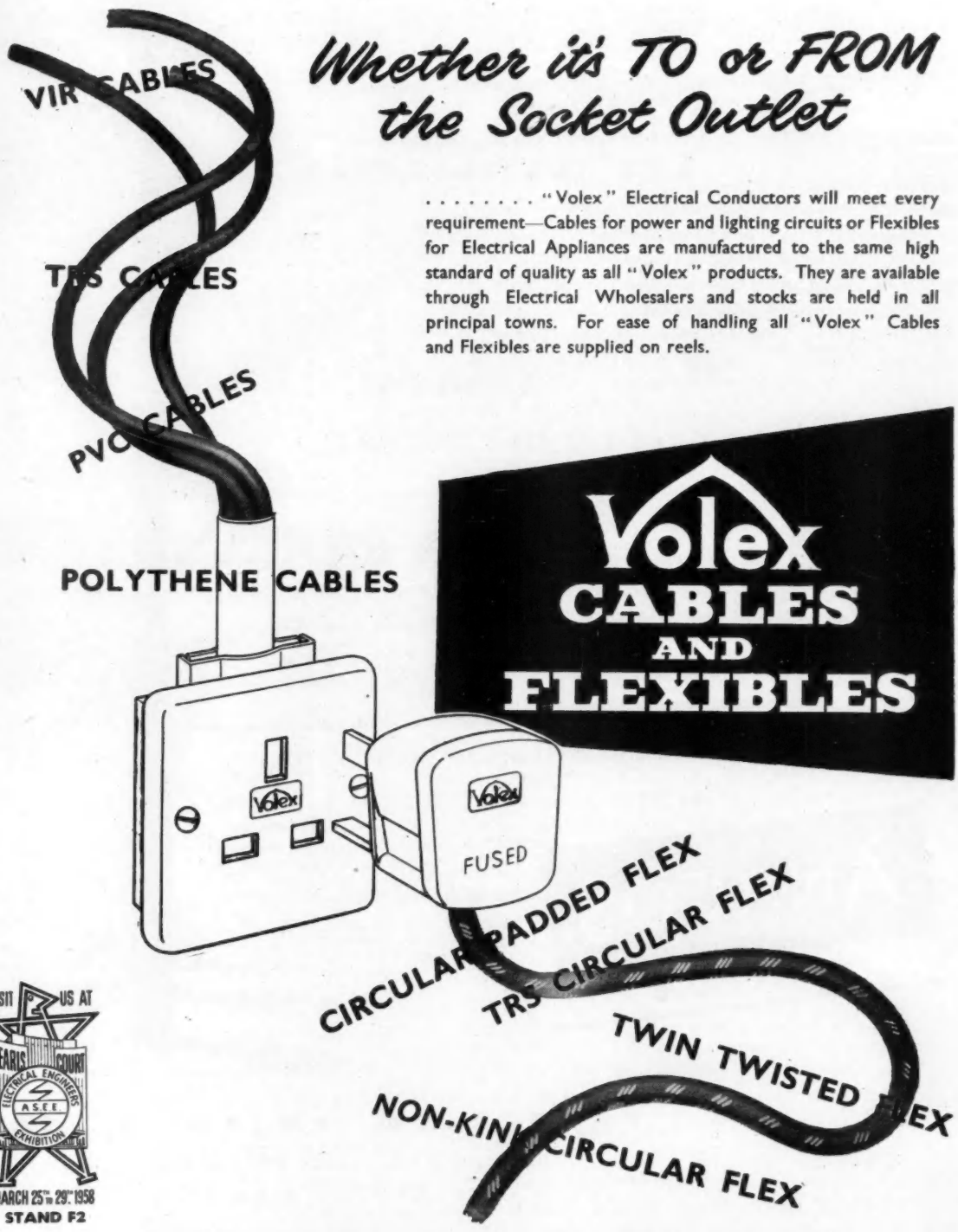
K·A·M UNIT
(Patent applied for. Regd. T.M.)

which can be fitted by simply bolting to existing structure.
Micro-adjustable. Flameproof.
Anti-static features can be incorporated.
Little, if any, guarding required.

INDUSTRIAL DIVISION
THE Kleen-e-ze BRUSH CO. LTD.
HANHAM · BRISTOL

Whether it's TO or FROM the Socket Outlet

. . . . . "Volex" Electrical Conductors will meet every requirement—Cables for power and lighting circuits or Flexibles for Electrical Appliances are manufactured to the same high standard of quality as all "Volex" products. They are available through Electrical Wholesalers and stocks are held in all principal towns. For ease of handling all "Volex" Cables and Flexibles are supplied on reels.



VISIT US AT EARLS COURT ELECTRICAL ENGINEERS EXHIBITION ASEE
MARCH 25TH to 29TH 1958
STAND F2

Volex VOLEX ELECTRICAL PRODUCTS LTD
SALFORD 6

Telephone: PENdleton 4373 Telegrams: "VOLEXPROD", Salford 6

C

Power in transit

The wires of the grid system cover the country from Lands End to John o'Groats bringing to towns and villages power and lighting in the most economical way.

Anacos Copper Strand for overhead power transmission is made to British Standards in hard drawn Copper and Cadmium-Copper.

ANACOS REGD.
COPPER STRAND

FREDERICK SMITH & CO.

Manufacturers of 'Anacos' Copper and Copper Alloy Conductors

ANACONDA WORKS · SALFORD 3 · LANCS

BARE AND INSULATED ELECTRICAL CONDUCTORS OF ALL TYPES

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED	FREDERICK SMITH & CO.	THE LIVERPOOL ELECTRIC CABLE CO. LTD.	VACTITE WIRE CO. LTD.

the *BEST*
Glass Fibre Flat Sheet is

PERMAGLASS

Available in Polyester, Melamine, Epoxide or Phenolic resins, using fine or coarse weave cloth reinforcement as follows:-

GRADE 83/AE *Polyester/Fine Weave*
A general purpose fine weave glass cloth polyester laminate suitable for electrical and mechanical purposes.

GRADE 83/JE *Polyester/Coarse Weave*
A general purpose coarse weave glass cloth polyester laminate, generally similar to Grade 83/AE but for use in greater thicknesses.

GRADE 84/AE *Epoxide/Fine Weave*
A fine weave glass cloth epoxide resin laminate having exceptional electrical and mechanical strength.

GRADE 84/JE *Epoxide/Coarse Weave*
A coarse weave glass cloth epoxide resin laminate, generally similar to Grade 84/AE but for use in greater thicknesses.

GRADE 81/AE *Phenolic/Fine Weave*
A fine weave glass cloth phenolic resin laminate with outstanding resistance to chemicals and good electrical properties.

GRADE 82/AE *Melamine/Fine Weave*
A fine weave glass cloth melamine resin laminate which is non-inflammable, has good electrical properties and conforms to Def 5000, spec. M.1.

All grades can be punched in thicknesses of up to ½ in. Natural colour pigmented finishes are available.

Maximum sheet size : 70 in. x 34 in. for all thicknesses up to ½ in.
(Thicker sheets pressed by special arrangement).

Typical applications include arc barriers, terminal strips, separators, panels, ducting, printed circuitry, pull links, washers and all kinds of punched and machined parts.

For fuller Technical Data write to:

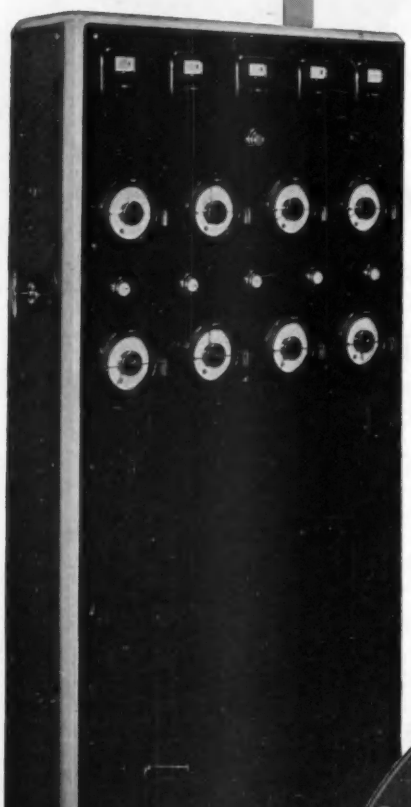
PERMALI LIMITED

PERMAGLASS DIVISION · GLOUCESTER · Telephone Gloucester 24941

CHAMBERLAIN AND HOOKHAM

TYPE P PROCESS TIMERS

FOR ACCURATE AND AUTOMATIC PROCESS CONTROL



- ★ Scale ranges from 0 – 10 secs. up to 24 hours.
- ★ Settings down to 1/10 sec.
- ★ Accuracy within 0·25% of full scale range.
- ★ Available as single units for self mounting or as complete control panels.
- ★ Any operation requiring time control by electrical means can be regulated by this instrument.

Chamberlain & Hookham Ltd.

SOLAR WORKS, BIRMINGHAM 5. TELEPHONE: MIDLAND 0681 & 0682

London Office: MAGNET HOUSE, KINGSWAY, W.C.2. TELEPHONE: TEMPLE BAR 8080

TYPE P PROCESS TIMER
CAT. SECTION 11300

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF COLWYN BAY

Trunk Road A.55 : Lighting

Section 3: Cefn Road to Highlands Road
Section 5: Brompton Avenue to Station Road, Mochdre

TENDERS are invited for the following works required in the lighting of approximately 2.1 miles of Trunk Road in the Borough :—

1. The provision and erection of Class A Lighting Columns.
2. The provision and fixing of Lanterns, Control Gear and other equipment.
3. The provision and laying of Lighting Cable (approx. 2,100 yds.).

Separate tenders will be considered for Items 1, 2 and 3 or for the whole of the works.

Plans may be inspected and copies of the tender documents obtained upon application to Mr. H. Wilman, A.M.I.C.E., Borough Engineer and Surveyor, Whalley Range, Lansdowne Rd., Colwyn Bay.

Tenders in plain sealed envelopes, "Trunk Road Lighting, Sections 3 and 5," must be delivered to the undersigned not later than 12 noon on Thursday, 20th February, 1958.

The Council does not undertake to accept the lowest or any tender.

HAROLD E. BRAITHWAITE,
Town Clerk.

Town Hall, Colwyn Bay.
27th January, 1958. 2243

WARMINSTER URBAN DISTRICT COUNCIL

Supply and Erection of Group "A" Lighting Equipment

TENDERS are invited for the supply, delivery and erection of 104 Lanterns and fittings for 140-watt Sodium Discharge Lamps, together with tubular steel columns, brackets and other equipment.

Specification, bills of quantities and form of tender may be obtained from the Surveyor to the Council on deposit of £2, which will be returned upon receipt of a bona fide tender not subsequently withdrawn.

Tenders, in plain sealed envelopes endorsed "Tender, Street Lighting," must be delivered to me by 12 noon on Saturday, 22nd February, 1958.

The Council does not bind itself to accept the lowest or any tender.

W. H. EDWARDS,
Clerk of the Council.

Council Offices,
19, Portway,
Warminster, Wilts. 2200

THORNE PARISH COUNCIL

Street Lighting, Bawtry-Selby T.R. (A614)

TENDERS are invited for the supply, erection and putting into service a Group A system of 45 140-watt Sodium Vapour Lamps and 40 Concrete Columns and 5 Wall Brackets.

Forms of tender, specifications and bill of quantities can be obtained from, and the plan, together with the general conditions of contract, can be seen at the office of C. W. Waller, Clerk, 64, King Street, Thorne, near Doncaster, on the payment of a deposit of £2 2s., which will be refunded on receipt of bona fide tenders.

Tenders must be delivered to the undersigned by first post on Saturday, 22nd February, 1958.

The Council do not bind themselves to accept the lowest or any tender.

C. W. WALLER, F.R.I.A.,
Clerk.

64, King Street,
Thorne, nr. Doncaster. 9256

SITUATIONS VACANT

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area
BARNSLEY DISTRICT

DISTRICT COMMERCIAL ENGINEER. Applicants must be conversant with all matters connected with the commercial organisation of a large and mainly industrial district and be experienced in the control of staff. They must have experience in negotiations with large power consumers, in development work, contracting, service centre organisation, street lighting, the preparation of statistics and reports, and in general management.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers. The successful applicant will be required to live in the Barnsley District.

Salary N.J.B. Class G, Grade 4, £1,160/£25/£1,235 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 21st February, 1958.

Head Office
CHIEF ENGINEER'S DEPT.

THIRD ASSISTANT ENGINEER, DISTRIBUTION DESIGN (Substations). The successful applicant will be required to assist with the design of indoor and outdoor substations operating at voltages of 33 kV and above, the preparation of specifications for substation plant, negotiations with plant manufacturers, and inspection of equipment in course of manufacture.

The minimum technical qualifications are the possession of a good Higher National Certificate in Electrical Engineering and Graduate Membership of the Institution of Electrical Engineers.

Applicants should have had a few years' general experience of field construction work and should preferably have some practical knowledge of the construction and erection of substation plant.

The work offers scope for the development of technical knowledge and experience, particularly in respect of switchgear, transformers and protective gear.

Salary N.J.B. Schedule B, Grade AX-EX, £895/£25/£1,020/£1,140 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Nr. Leeds, not later than 21st February, 1958.

No. 1 (Bradford) Sub-Area
BRADFORD DISTRICT

SENIOR DRAUGHTSMAN (Engineering). Applicants should have a good general and technical education, and should have had experience in mains recording work and be capable of supervising the work of cartographic and recording draughtsmen. They should have a knowledge of surveying and experience in the preparation of substation layouts and electrical schematic diagrams.

Salary N.J.B. Schedule D, Grade 5, £760/£20/£860 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford, not later than 21st February, 1958. 2289

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT ENGINEER,
Guildford District.

Salary £740 × £15 to £785 per annum under N.J.B. Class E, Grade 9. Superannuable. Applicants should hold Higher National Certificate in Electrical Engineering or its equivalent, and have had practical experience in construction, operation and maintenance of underground and overhead distribution systems.

Applications, naming two referees, on forms from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBOARD, Rough Rew, Horsham Road, Dorking, Surrey, by 19th February, 1958.

ASSISTANT DISTRICT COMMERCIAL ENGINEER,
Herne Bay/Canterbury District.

Salary £790 × £15 to £835 per annum under N.J.B. Class E, Grade 8. Superannuable. Applicants must hold the National Certificate in Electrical Engineering or its equivalent and have had considerable experience in a District Commercial Department, including the preparation of specifications and estimates for domestic, commercial and industrial installations. The successful candidate will be required to conduct correspondence and negotiations with consumers.

Applications, naming two referees, to S. J. C. Ellis, A.I.E.E., Joint District Manager, SEEBOARD, 65, Mortimer Street, Herne Bay, Kent, by 19th February, 1958.

ASSISTANT
(Expenditure and Stores),
Croydon and Purley District.

Salary £992 to £1,070 per annum (including London Area allowance) under N.J.C. Grade 6. Superannuable. Candidates should be good organisers, suitably qualified, have a wide experience of District office work and be able to take charge, under the District Chief Clerk, of expenditure, wages, stores and the clerical functions of the contracting department for a large district of 130,000 consumers.

Applications, naming two referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 19th February, 1958.

JOINTER (E.H.T.),
Maidstone District.

Wages 4s. 7½d. per hour for 44-hour 5-day week, under N.J.I.C. Agreement. Applicants must be experienced in working on live low and medium voltage cables and have experience in jointing cables up to and including 11 kV.

Applications, naming two referees, to C. E. Hollingworth, B.Eng., M.I.E.E., District Manager, SEEBOARD, Fairmeadow, Maidstone, by 17th February, 1958.

A. L. BURNELL,
Secretary. 2295

A. REYROLLE & CO. LTD. HEBBURN

have a vacancy in their RESEARCH DEPARTMENT for a SENIOR DESIGNER.

The work entails the design of a very wide range of equipment, including experimental circuit-breaking devices and general electrical and mechanical research equipment, principally for the purpose of measurement.

Applicants should have a sound knowledge of mechanical and electrical engineering and several years of design experience.

The appointment is pensionable, and assistance may be given with housing.

Write in confidence with full particulars to the Chief Engineer, A. Reyrolle & Co. Ltd., Hebburn, Co. Durham. 2249

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

GENERAL ASSISTANT ENGINEER (Chemist), LINCOLN POWER STATION (Vacancy No. 18/58/ER).

Candidates must have had a sound technical training and some previous experience in an industrial laboratory and should hold the Ordinary National Certificate in Chemistry.

The duties will include the routine analysis of coal, water and oil, but the post offers opportunities of gaining general experience in the chemical control of power station operation.

The salary will be within the range £540-£680 per annum in accordance with the National Joint Board Agreement.

Closing date for receipt of applications, 12th February, 1958.

GENERAL ASSISTANT ENGINEER (Shift Control Duties), NORTHAMPTON POWER STATION (Vacancy No. 21/58/ER).

Applicants should have served an apprenticeship or had practical training suitable to the industry and should possess a sound general and technical education. Possession of an Ordinary National Certificate in Electrical Engineering is a minimum requirement.

Salary will be within the range (£540-£680 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 19th February, 1958.

These appointments will be pensionable under the terms of the Staff Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

29th January, 1958. 2265

TECHNICAL SALES ENGINEERS

AS part of a scheme for extending their activities, the makers of electric motors and generators up to 300 kW require TECHNICAL SALES ENGINEERS to represent them in the West Midlands, North Midlands and Eastern England.

Appointments provide scope for men eager to sell first-class products. Qualifications in electrical engineering are desirable, but not as essential as practical experience with D.C. motors and generators.

Initial basic salary £900 to £1,200 per annum depending upon experience. Applications will be treated in the strictest confidence.

Write giving details of age, education, technical training and subsequent experience to Sales Manager, Mawdsley's Limited, Dursley, Gloucestershire.

2277

INSPECTING ENGINEER

to be based in Manchester, required by consulting engineers to cover all types of electrical control gear, including instrumentation as applied to generation and transmission systems.

Applicants should have had training with reputable manufacturers in this field and must possess technical qualifications to at least Graduate I.E.E. standard. Salary will be commensurate with the character of the appointment.

Application forms should be applied for in writing to Staff Appointments, Kennedy & Donkin, 813a, Wilmslow Road, Didsbury, Manchester, 20. 2145

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

FIRST ASSISTANT STATION CHEMIST, BANKSIDE POWER STATION (Vacancy No. 58/75).

Sound technical training to at least O.N.C. level with experience in power industry chemistry, and preferably have held responsible post in laboratory. Salary Class H, Grade 9 = £935 p.a.

ASSISTANT MAINTENANCE ENGINEER (Electrical), DEPTFORD WEST POWER STATION (Vacancy No. 58/76).

Experience in maintenance of power station H.T. and L.T. electrical apparatus. Salary Class J, Grade 9 = £985 p.a.

ASSISTANT TO TURBINE HOUSE SUPERINTENDENT, FULHAM POWER STATION (Vacancy No. 58/77).

Duties principally concerned with mechanical maintenance of turbine plant, air compressors, general auxiliaries and coal handling plant, including cranes. Sound technical training with considerable experience in overhaul and maintenance of large turbine plant essential. Salary Class K, Grade 9 = £1,045 p.a.

ASSISTANT MAINTENANCE ENGINEER (Electrical), BRUNSWICK WHARF POWER STATION (Vacancy No. 58/78).

Experience of overhaul and maintenance of E.H.T. switchgear and large motor and control gear essential. Salary Class K, Grade 9 = £1,045 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 17th February, 1958. 2264

LANCASHIRE DYNAMO GROUP

DYNAMO & MOTOR REPAIRS LTD.

APPLICATIONS are invited for the following appointment in this company :—

ASSISTANT TO THE MANAGING DIRECTOR.

An Assistant to the Managing Director is required at Dynamo & Motor Repairs Ltd., Wembley, and applications are invited from men, age 30-40, having works and technical experience in rotating electrical machinery. Experience with other types of electrical plant will be an advantage.

The duties will be to assist the present Managing Director in every aspect of the company's business, which includes the repair and reconditioning of electrical machinery and plant and the organisation of electrical plant maintenance and service.

There is a good pension scheme and the appointment provides an excellent opportunity for a keen, resourceful man in this subsidiary of a progressive, expanding group.

The commencing salary will depend on experience and qualifications and the prospects in this position are good for the right man.

Applications should be sent in confidence to the Managing Director, Dynamo & Motor Repairs Ltd., Wembley Park Works, North End Road, Wembley, Middlesex. 2304

ELECTRICAL ENGINEERS

required for Engineering Department of Automatic Motor Control Gear Makers in West Midlands due to expansion.

The work comprises the derivation of schematic diagrams, selection and layout of components and issue of manufacturing instructions.

A pension scheme is in operation and assistance towards removal expenses will be paid in approved cases.

Apply in confidence stating age, experience and salary required to—Box 363.

A. REYROLLE & CO. LTD. HEBBURN

have vacancies in their RESEARCH DEPARTMENT for the following staff to deal with an expansion of the work in the laboratories.

1. UNIVERSITY GRADUATES, preferably with Hons. Degree in Electrical Engineering or Physics to undertake research into problems relating to power systems, switchgear, protective gear, electronics, dielectric phenomena, insulating materials, and the control and instrumentation of nuclear reactors.
2. MEN WITH A PASS DEGREE OR H.N.C. in Electrical Engineering to undertake general technical work and co-ordination of development testing relating to the above.
3. MEN WITH H.N.C. OR O.N.C. as Testing Engineers in the electrical laboratories dealing with the above.
4. YOUNG MEN without technical qualifications but who have served a recognised electrical engineering apprenticeship and who are proceeding with their studies will be considered for training as Testing Engineers.

REYROLLE are among the largest manufacturers of switchgear in the world ; they are a member firm of the Nuclear Power Plant Company and their work covers a wide field. The appointments are in accordance with staff conditions and offer interesting work with good prospects at salaries commensurate with qualifications and experience. Assistance may be given with housing.

Write in confidence with full particulars to the Chief Engineer, A. Reyrolle & Co. Ltd., Hebburn, Co. Durham. 2247

METER AND RELAY CONTRACTS ENGINEERS

'ENGLISH ELECTRIC' STAFFORD

OPENINGS exist in the expanding Meter and Relay Department here, for Engineers to handle Power Systems Relay and Meter Contracts. Applicants should preferably have had experience in the light electrical manufacturing industry and be technically qualified to the Ordinary National Certificate or equivalent standard. These appointments are permanent, progressive and will rank for normal admission after the usual probationary period into the company's staff pension scheme.

The work involves the translation of customers' specifications into manufacturing instructions and both engineering and commercial supervision of contracts through all stages of their execution.

As well as providing an opening into an interesting and promising career we should mention that this work is carried on in a large new office building under pleasant and congenial surroundings.

Suitable applicants will be invited to Stafford at our expense when they will be able to gain an impression of the locality as well as the work they will undertake.

Applications giving full details of experience and qualifications should be addressed to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting Ref. ER1297K.

359

CUMBERNAULD DEVELOPMENT CORPORATION

AN ELECTRICAL ENGINEER is required for the Department of the Chief Architect and Planning Officer on Whitley Council for New Towns Staff. Salary scale APT. VII (£999-£1,230) (at present under review by Whitley Council). Local Government superannuation. Minimum qualifications, Higher National Certificate or Corporate Membership I.E.E.

Experience of heating work, other than electrical, an advantage.

Application forms from Chief Architect, Cumbernauld House, Cumbernauld, by Glasgow, to be returned not later than Monday, 17th February, 1958. 2303

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area, Northwood District

FIRST ASSISTANT DISTRICT ENGINEER (12/58.R.).

Candidates should have had a sound technical training and wide experience in the planning, construction, operation and maintenance of H.V. and L.V. underground systems, including substations, at voltages up to and including 33 kV.

Salary N.J.B. Class F, Grade 5 (£995-£1,055) plus London allowance.

Apply by letter, within fourteen days, to the Manager, Northwood District, Eastern Electricity Board, 1, Love Lane, Pinner, Middx.

Norfolk Sub-Area, Great Yarmouth District

ELECTRICITY SERVICE MANAGER, LOWESTOFT (13/58.R.).

Candidates should have had extensive experience in all the commercial activities pertaining to a large branch office and service centre and be thoroughly competent to advise consumers on the utilisation of electricity. Candidates should also be competent to undertake certain local engineering switching duties.

Salary N.J.B. Class F, Grade 5 (£995-£1,055).

Apply by letter, within fourteen days, to The Manager, Eastern Electricity Board, Norfolk Sub-Area, 4, Duke Street, Norwich.

Northmet Sub-Area, Stevenage District

THIRD ASSISTANT ENGINEER (Ref. 706) (14/58.R.).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 9 (£790-£835).

Apply by letter, to H. L. Sumner, Manager, Eastern Electricity Board, Walkern Road, Stevenage, Herts, by 17th February, 1958. 2298

ELECTRICAL/MECHANICAL ENGINEERING DESIGNER

THIS senior position with Merseyside company of medium size calls for rotating machine design ability, both electrical and mechanical, of a high order. Experience on control gear and systems, including electronics, is also desirable.

The company, associated with a large group, expects to pay an attractive four-figure salary to a Designer who is looking for a challenging position in which he can both develop and extend the Company's existing range of products. These products are of small/medium size and special-purpose type.

First class qualifications are necessary; adequate benefits are available. Applications, which should include age and salary indication, will be treated most confidentially.

Box 2222.

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Kent Suburban District at Erith, Kent.

Applicants should have a good general education, must be neat and accurate draughtsmen and should preferably have had experience with an electricity supply authority in one of the following: electrical plant layout; elementary building construction; mains recording.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £635 - £755 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad St., London, E.C.2, to be returned completed by 15th February, 1958. Please quote ref. PER/2431/R. 2288

SOUTHERN RHODESIA ELECTRICITY SUPPLY COMMISSION

Assistant Engineer II, Transmission

A VACANCY exists for an experienced qualified engineer in the Commission's Transmission Section at the Head Office in Salisbury.

The transmission section is expanding rapidly and comprises over 7,000 miles of line including approximately 1,200 miles of line operating at between 33 kV and 88 kV.

Applicants (under 45) should be in possession of a B.Sc.(Eng.) degree and have had at least five years' experience with responsibility in one or more of the following:—

(1) Design and construction of transmission lines including supervision of construction staff and surveyors.
(2) Engineering and supervision of large switchgear and transformer installation including control gear, protective equipment and cabling.
(3) Design and construction of high voltage outdoor substations and switching stations.

The successful applicant will commence in Grade II at a gross salary of £1,650 p.a. within the scale £1,650 p.a. by increments to £1,800 p.a. with prospects of promotion to Grade I depending on ability.

The above salary includes a cost-of-living allowance at present 17½% of basic salary and where applicable a child allowance is paid.

Applications stating age, marital status, qualifications and experience to Secretary (R/ESC), Rhodesia House, 429, Strand, London, W.C.2, by 1st March. 2296

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. Stations. Qualifications required: (a) O.N.C. Electrical or Mechanical, or show that equivalent standard of technical education attained; (b) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (c) 3 years' employment in electrical and mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference given to candidates with supervisory experience subsequent to (b) and (c).

Work consists of installation, operation and maintenance and high-medium-voltage electrical distribution system electrical installation, generating plant, steam and hot water heating systems and miscellaneous works plants, tools and equipment.

Commencing salary according to age, qualifications and experience on range £655-£820. Appointments non-pensionable. Liability for tours of duty overseas for which special allowance payable in addition to higher salary.

Applications from natural-born British subjects only, up to age 45 years.

Write giving age, full details of qualifications and experience (quoting PE.3140 and PE.3141) to Manager, Ministry of Labour and National Service, 1-6, Tavistock Square, London, W.C.1. Only candidates selected for interview will be advised. 261

NIGERIAN PORTS AUTHORITY

a recently created public corporation, invites applications from suitably qualified candidates for the post of LIGHTHOUSE AND BUOYAGE ENGINEER. Applicants, preferably under 45 years of age, should have had wide experience in the maintenance of lighthouse equipment and mechanism, both gas and electric, and of the maintenance of large ocean and river light buoys and light beacons; electrical knowledge and experience would be an advantage.

Salary in range £1,200 to £1,650 plus £300 per annum overseas pay (where applicable). Appointments would be for one tour in first instance and thereafter, subject to satisfactory service, on permanent basis. Non-contributory pension fund. Tour normally 12/18 months. Leave on basis of 7 days for every completed month of service. Free first class passages for officer and wife. Additional passages and allowances for children. Furnished accommodation provided at reasonable rental.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/42610/EF. 2266

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Wolverhampton and District Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (Cannock District).

The successful applicant will be required to assist in the construction and maintenance of overhead and underground mains and substations. Technical qualifications desirable.

Salary £590/£635 per annum (N.J.B. Grade E.12).

Apply by letter, within fourteen days, stating age, experience, present salary and position to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

North Staffs. Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Newcastle District).

Applicants should have had a sound technical training and experience in the operation and maintenance of distribution systems. Technical qualifications desirable.

Salary £740/£785 per annum (N.J.B. Grade E.9).

Apply by letter, within fourteen days, stating age, experience, present salary and position to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

A. STEPHENS,
Secretary.
2299

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointment:—

FOURTH ASSISTANT ENGINEER (Development), Chief Commercial Officer's Department, Board Headquarters.

Candidates should have a sound technical training in mechanical and electrical engineering and some experience in the preparation of estimates, specifications and drawings for central heating plants is required. Qualifications leading to membership of the Institution of Electrical Engineers and/or the Institution of Heating and Ventilating Engineers are desirable.

Duties will include the design of electrical space heating schemes, including floor warming, electrode boilers and block storage heaters.

Present headquarters are at 351, Sauchiehall Street, Glasgow, C.2, but they will be transferred to the Board's new headquarters in Cathcart, Glasgow, in approximately twelve months.

Salary £810/£1,010 per annum in accordance with Class AX/DX, Grade 7 of Schedule B to the National Joint Board Agreement.

Apply, quoting Reference No. C1/58, on standard form AE6, available from the Secretary, P.O. Box 173, 351, Sauchiehall Street, Glasgow, C.2, not later than Friday, 21st February, 1958. 2245

JOSEPH LUCAS (ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

2278

Situations Vacant (continued)

UNIVERSITY OF CEYLON

APPLICATIONS are invited for a LECTURESHIP (Grade II) in ELECTRICAL ENGINEERING (Electrical Machinery) on the salary scale Rs. 6,600-360-8,400 per annum. Appointment may be made at a suitable point on the scale according to qualifications and experience.

QUALIFICATIONS: Honours Degree in Engineering. Two years of training or experience specially devoted to the design of electrical machines. Four years' teaching experience in a university. Corporate Membership of an Institution of Engineers. Research publications.

CONDITIONS OF SERVICE: The appointment will be for a period of four years in the first instance but may be extended at the discretion of the University Council. The post is not pensionable but the holder will become a contributor to the University Provident Fund, contributing 5% of salary and the University adding 10%.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 36, Gordon Square, London, W.C.1.

The closing date for the receipt of applications, in Ceylon and London, is 1st March, 1958. 2263

WALSALL AND STAFFORDSHIRE TECHNICAL COLLEGE

Principal: H. Cheetham, B.Sc.Hons., A.M.I.Mech.E., M.I.Prod.E.

LECTURER IN ELECTRICAL ENGINEERING

APPLICATIONS for the above post are invited from graduates in electrical engineering able to teach Electrical Engineering subjects, including Electrical Machines, to Higher National Certificate standard. Duties to commence on 1st May.

Salary will be in accordance with the Burnham Technical Report, 1956, viz.: £1,200 by £30 to £1,350 p.a.

Application form and further particulars may be obtained from the Principal, Walsall and Staffordshire Technical College, Wisemore, Walsall, Staffs., to whom completed application form should be returned not later than Friday, 28th February, 1958.

V. MILLSON,
Secretary to the Governors.
2300

A. REYROLLE & CO. LTD. HEBBURN

a member firm of the Nuclear Power Plant Company, have vacancies in their RESEARCH DEPARTMENT for the following staff.

1. UNIVERSITY GRADUATES, preferably with Hons. Degree in Electrical or Mechanical Engineering or Physics, to undertake research into problems associated with the control and instrumentation of nuclear reactors in power stations.
2. MEN WITH A PASS DEGREE OR H.N.C. in Electrical or Mechanical Engineering to undertake general technical work, co-ordination of development testing and quality control relating to the above.

The appointments are pensionable and offer interesting work with good prospects at salaries commensurate with qualifications and experience. Assistance may be given with housing.

Write in confidence with full particulars to the Chief Engineer, A. Reyrolle & Co. Ltd., Hebburn, Co. Durham. 2248

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER (Planning) in the Western Sub-Area of the Board, based at Tenby.

Salary Class G, Grade 10 (£790/£835) of the N.J.B. schedule.

Applications stating age, present position and salary, qualifications, experience and three referees should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Tuesday, 18th February, 1958. 2293

CENTRAL ELECTRICITY GENERATING BOARD

Yorkshire Division

Operational Research Section

APPLICATIONS are invited for an appointment as THIRD ASSISTANT ENGINEER, OPERATIONAL RESEARCH SECTION, Generation Operation Department, Divisional Headquarters, Leeds.

Commencing salary within range £895-£1,020 per annum, Grade 6, Class AX, National Joint Board Agreement (Schedule B), according to qualifications and experience, rising to an ultimate maximum of £1,140 per annum (Class EX).

Applicants should have good academic qualifications and the ability to apply scientific methods to investigations in the field of power station operation. Previous experience of operational research is not essential as suitable training will be given to the successful candidate.

Application forms obtainable from the Divisional Secretary (Establishments), Central Electricity House, St. Mary's Road, Leeds, 7, to be returned within 10 days of the appearance of this advertisement. 2302

ELECTRICAL ENGINEERS

DETAIL AND DESIGN DRAUGHTSMEN

PLANNING ENGINEERS

are required at our Motor Control Gear Works, Norwich.

Good working conditions. Contributory pension scheme. Assistance in obtaining housing. Attractive salary scales available for really good men.

Apply in confidence with details of age, qualifications, experience, etc., to :—

Personnel Officer
LAURENCE, SCOTT & ELECTROMOTORS LTD.
Gothic Works
Norwich

2126

ATOMIC POWER CONSTRUCTIONS LTD.

ELECTRICAL AND MECHANICAL DRAUGHTSMEN with power station experience who are interested in work on large nuclear projects.

SENIOR ELECTRICAL DRAUGHTSMAN with at least two years' experience of layout of switchgear and transformers, wiring diagrams and cabling required to take charge of drawing office.

SENIOR MECHANICAL DRAUGHTSMAN with at least two years' experience of layout of turbo-alternator plant, large steam pipework systems and associated pumping installations required to take charge of drawing office.

ALSO Electrical and Mechanical Draughtsmen with appropriate experience for progressive positions in the above drawing office.

Apply to :—

The Secretary (Ref. BD)
ATOMIC POWER CONSTRUCTIONS LTD.
28, Theobalds Road, London, W.C.1
2235

CHIEF DESIGNER

WANTED by an important firm manufacturing switchgear, a CHIEF DESIGNER, or a Designer of sufficient calibre who thinks, with sufficient reason, that he could attain this position within the next year or so. Must have experience of the latest practice in oil and air break high-voltage circuit breakers and ancillary gear, be capable of conducting and analysing short circuit tests, have creative imagination and the ability to profit from his failures.

Remuneration according to qualifications, but in no case mean.

North Midlands.

Box 2056.

BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION

Industrial Electric Heating Engineer

APPLICATIONS are invited for the appointment of an engineer with general knowledge of the utilisation of electricity for heat treatment and process heating.

Candidates should have experience of various types of industrial electric heating equipment, including furnaces, resistance heaters and high frequency heaters, and of their practical application in factories and works. The possession of a University Degree in Science or Engineering will be an advantage, ability to read French and/or German desirable. Salary within range £1,435/£1,560, plus £50 London allowance, with starting point according to experience and qualifications. Pension scheme available.

Applications, stating age, qualifications and experience and salary required, should be addressed, by 21st February, 1958, to the Director and Secretary, British Electrical Development Association, 2, Savoy Hill, London, W.C.2. 2220

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

ASSISTANT CONSUMERS' ENGINEERS required in the following districts:—

Liverpool Central. Salary £685/£730 per annum (N.J.B. J/14).

Liverpool South. Salary £635/£680 per annum (N.J.B. H/14).

Duties include estimating for contracting work and advising consumers on electricity supply matters.

Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Standard application forms should be forwarded to the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, not later than 19th February, 1958. 2287

CALTEX SERVICES LIMITED

A SENIOR POWER ENGINEER is required for our London office to handle design problems connected with thermal power plants covering water treatment and steam and power generation with the associated distribution networks.

Candidates, under forty years of age, must have had several years of similar experience since qualifying and be prepared to visit overseas installations from time to time.

A salary commensurate with qualifications and experience can be offered.

Apply in writing with all particulars, and quoting "LON," to Caltex Services Limited, Caltex House, Knightsbridge Green, London, S.W.1.

2143

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (Building) required in the Board's No. 4 Sub-Area Headquarters, Electricity House, Rhostyllen, near Wrexham. Salary within range £1,065/£1,140 per annum (N.J.B. K/8).

Applicants should have experience of the design, construction and maintenance of buildings and associated works, and the preparation of drawings and specifications. Possession of suitable technical qualifications advantageous.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager at the above address. Closing date 15th February, 1958. 2244

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of COMMERCIAL ASSISTANT in District 345 (Caerphilly) in the Central Sub-Area of the Board.

Salary Class E, Grade 9 (£740/£785) of the N.J.B. Agreement.

Applications, stating age, present position and salary, qualifications, experience and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Tuesday, 18th February, 1958. 2292

PETROCHEMICALS LIMITED

require a

SHIFT ELECTRICAL CONTROLLER

in their Power House.

Applicants should preferably be of O.N.C. (Electrical) standard with experience of A.C. generation and distribution, H.T. and L.T. switchgear and transformers with the usual protective systems. The duties include control of cooling water, compressed air and cooling tower pressure systems. The applicant should also have experience in the control of operating staff.

The salary with this position will be up to £800 per annum plus shift allowance.

Excellent working conditions exist and a voluntary contributory staff pension fund is in operation. Transport from most areas.

Applications giving full details of previous experience and qualifications should be addressed to the Industrial Relations Manager, Petrochemicals Ltd., Partington Industrial Estate, Urmston, Nr. Manchester, quoting ref. ENG/L.70. 2246

VACANCIES, SHIFT ENGINEERS, TECHNICAL GRADE III CENTRAL POWER STATION (WD) ALDERSHOT

PROVINCIAL salary scale £655 (at age 26) to £820 plus shift disturbance allowance of 6s. 6d. per shift.

QUALIFICATIONS: Ordinary National Certificate in Electrical or Mechanical Engineering or evidence of equivalent standard in technical education and 5 years' apprenticeship or equivalent with engineering concern giving good comprehensive training.

EXPERIENCE: After completing apprenticeship or equivalent, candidates to have had 3 years' experience in charge of operation and maintenance of steam, diesel electric generating plant and switchgear.

Applications with testimonials to C.E.E., Aldershot District, Central Power Station, Thornhill Road, Aldershot. 2297

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (Meters) required at No. 2 Sub-Area Headquarters. Salary within range £790/£835 per annum (N.J.B. K/13).

Applicants should preferably have served a recognised apprenticeship in a meter department, and possess suitable technical qualifications. The post is within the establishment of the sub-area engineering department, but the successful applicant will be required to undertake duties in all districts of the sub-area, particularly in Warrington.

Appointment subject to medical examination. Pension scheme.

Application forms, obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Near Northwich, Cheshire, should be returned not later than 19th February, 1958. 2286

ELECTRIC TRANSMISSION LIMITED

Newstead, Trentham, Staffs

APPLICATIONS are invited for the position of SENIOR ELECTRICAL ENGINEER. Applicants should possess a sound technical training, including university degree in science or engineering, and/or Corporate Membership of the Institution of Electrical Engineers.

Successful candidate would be responsible for the design, development and testing of high-voltage H.R.C. fusegear and high-voltage heavy current airbreak switchgear.

Salary would be commensurate with qualifications and experience.

Write, stating age, qualifications, details of experience and salary required to the General Manager. 2305

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER in District 107 (Tenby) in the Western Sub-Area of the Board.

Salary Class C, Grade 7 (£740/£785) of the N.J.B. Agreement.

Applications, stating age, present position and salary, qualifications, experience and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Tuesday, 18th February, 1958. 2291

DURHAM COUNTY COUNCIL

Architect's Department

(a) ELECTRICAL ENGINEERING ASSISTANTS.
(b) HEATING ENGINEERING ASSISTANTS.

Salary £725 × £30 to £845 p.a.

Applicants to have appropriate Higher National Certificate and to have had drawing office experience.

Forms and further particulars from County Architect, South Street, Durham. Closing date 28th February, 1958. Canvassing members of the Council is prohibited.

J. K. HOPE,
Clerk of the County Council.
2301

DESIGNER OF INDUSTRIAL LIGHTING EQUIPMENT

Applications for the above appointment are invited by

THE BENJAMIN ELECTRIC LIMITED.

Knowledge of fabricating techniques, finishes, lamps and control gear desirable, but initiative and ideas equally important.

The vacancy carries excellent prospects, with appropriate salary according to age, experience and qualifications. Staff luncheon room and pension scheme.

Apply Chief Technical Engineer, Brantwood Works, Tottenham, London, N.17. 177

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER (Mains) in District 462 (Newport) in the Eastern Sub-Area of the Board.

Salary Class F, Grade 12 (£635/£680) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Tuesday, 18th February, 1958. 2294

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for two vacancies for ENGINEERING DRAUGHTSMEN in the Central Sub-Area Drawing Office at Cardiff.

Salary Schedule D, Grade 6 (£595/£715) of the N.J.B. Agreement.

Applications, stating age, present position and salary, qualifications, experience and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Friday, 14th February, 1958. 2290

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

A CHIEF instrument engineer is required by Pilkington Brothers Limited to co-ordinate instrumentation in the various factories of the group and to set up and run a Central Instrument Department under the Group Chief Engineer. The applicant should have a degree in electrical engineering or physics, or an equivalent qualification, and have a knowledge of instrumentation, control panel design and electronics. He should have some knowledge of electrical, mechanical, hydraulic and pneumatic control systems. The ability to develop equipment for special applications is desirable, and a sound fundamental knowledge of the principles involved is essential. Replies stating age, qualifications and experience to the Personnel Officer (Staff), Pilkington Brothers Limited, St. Helens, Lancashire. 2236

ARMATURE winder wanted with repair shop experience, also preferably accustomed to outside installation breakdowns of motors and control gear.—Dow & Nicholson Ltd., 10, Wellington Place, Aberdeen. 2280

A YOUNG engineer required (recently demobbed National Serviceman suitable), having Advanced level Physics, O.N.C. or equivalent, for inside sales work leading to outside representative. Leading company manufacturing automatic controls which has its own training school. Must be prepared to study. Write with brief details to Honeywell-Brown Ltd. (ERA), 1, Wadsworth Rd., Perivale, Greenford, Middlesex. 2250

APPLICATIONS are invited for position of technical sales engineer for London and Southern England. Applicants must have good electrical engineering background and basic knowledge of motor control equipment in all its applications, and must have good existing connections with users in the area concerned. Please write giving full particulars to Sales Director.—Box 2279.

APPLICATIONS are invited from men trained to at least Higher National level to undertake research and development work at a high level of responsibility in mechanical side of larger capacity circuit breakers and switchgear. Reply giving full particulars of age, experience and salary required to—Box 2306.

AREA representative required Birmingham district by manufacturers of specialised industrial electrical appliances. Position calls for basic knowledge of electrical equipment and fan performance, ability to evaluate problems and to submit recommendations. Industrial connections essential. Please submit particulars to—Box 2267.

ARMATURE winders wanted for repair shop. Apply—Minta, Hartley Road, Luton. 9244

ARMATURE winding chargehand required, experienced in mass production. (Coil winding experience considered.) Used to controlling female labour for factory situated in Woolwich, but may later be transferred to our factory in Southwark. Splendid opportunities for promotion. Letters only, stating age, experience and salary required, to Works Manager, Oliver Pell Control Ltd., Cambridge Row, Burrage Road, Woolwich, London, S.E.18. 2281

ASSISTANT engineer-in-charge reqd. at County Hall, London, S.E.1, with experience in maintenance and improvement of large and varied electrical installations and control of staff. Some evening duties during meetings of Council, and other functions. Salary £742 10s. to £927 10s. p.a. Applicn. form from Chief Engineer (58/10), L.C.C., County Hall, London, S.E.1. (185) 2307

ASSISTANT for sales office, sound knowledge electrical accessory trade, knowledge export an advantage. Full details in writing, age, experience and salary to—S. O. Bowker Ltd., 19/21, Warstone Lane, Birmingham. 2147

ASSISTANT works manager required for electric cable works, paper-insulated section. Reply with full details of past experience to the Managing Director, Sterling Cable Company Ltd., Aldermaston, Berkshire. 2251

CABLE and lighting installation. Experienced engineers and draughtsmen reqd. to cover important contracts in U.K. and overseas. Engineers for planning of telecommunications network or supervision of subsequent installation and for power cable installations in generating stations and industrial plant. Draughtsmen for preparation of cable layouts on all these varied projects. Good practical and technical background desirable. Applicants must be in good health and willing to travel as necessary. Age limit 45 unless with previous experience abroad. Permanent pensionable staff appointments. Write with full details in confidence, stating age, experience and salary expected in U.K. to—Staff Officer, Ref. 744/1, Siemens Edison Swan Ltd., Woolwich, London, S.E.18. 2160

CAPABLE electrical designer/draughtsman required, age not less than 25 years; some mechanical experience an advantage for development on electrical application to machine tools. 5-day week, staff pension scheme. Write stating age, full experience and technical qualifications to—Employment Office, Alfred Herbert Ltd., Coventry. 2162

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

***Situations Vacant** (continued)*

COMMISSIONING engineer, aged 35 to 50 years, with wide experience of commissioning of power station plant or similar heavy industrial plant. To be responsible to Chief Engineer for formulating and implementing a comprehensive commissioning programme for complete nuclear power station. Must be willing to travel and capable of accepting major responsibility. This is a senior and pensionable post. Minimum qualification A.M.I.Mech.E., A.M.I.E.E., or equivalent. Applications giving age, details of education, qualifications and experience.—Box 2268.

CONTRACTS engineer required for interesting work on specialised electrical equipment. Good prospects with a small firm in N.W. London for a young man with experience in automatic control gear.—Box 2163.

DESIGNER/draughtsman for design and development of special low tension switch and fusegear. Good salary and excellent prospects in an expanding company.—Peppers of Woking Ltd., Stanhope Road, Camberley, Surrey. 2232

DESIGNER, experienced in design and manufacture of transformers between fractional VA and 250 kVA. Designs for particular applications a speciality. Knowledge of chokes and rectifiers an advantage. Send summary of experience and qualifications, stating age and salary required, to—Manager, Transformer Department, Austin Walters & Son Ltd., Ayres Rd., Old Trafford, Manchester, 16. 2237

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

DRAUGHTSMAN, electrical, with experience of sheet metal work, required. Position is permanent and pensionable. Write Chief Engineer, Astral Switchgear Ltd., Alma Road, Ponders End, Enfield, Middlesex. 2252

DRAUGHTSMAN required immediately for light electro-mechanical instrumentation of precision nature. Previous experience of this work essential and O.N.C. in Electrical Engineering advantageous. Pleasant conditions, 5-day week, A.E.S.D. rates, bonus and superannuation schemes. Junior draughtsman required at once also. Apply—Hendrey Relays Limited, 392, Bath Road, Cippenham, Slough, Bucks. 2308

DRAUGHTSMAN wanted. Electrical experience an advantage. Opportunity for ambitious man in Westminster office. Write age, experience and salary required.—Box 2165.

DRAUGHTSMAN wanted for mechanical engineering work and pressure vessel design. Good prospects, superannuation scheme and pleasant working conditions.—Bastian & Allen, Ferndale Terrace, Harrow. 2164

ELECTRICAL and/or mechanical engineering graduates required by large Australian mining company operating in Queensland. Minimum starting salary £1,210 (Australian) per annum plus variable lead bonus at present £4 7s. 6d. per week. Free travel to Australia. Experience in the repair, maintenance and construction of mining, milling, smelter and power generating equipment will be gained. Single or married accommodation available. Apply to Secretary, Mount Isa Mines Limited, Adelaide House, King William St., London, E.C.4. 2239

ELECTRICAL engineer required by large Australian mining company operating in Queensland. Salary up to £2,000 (Australian) per annum plus variable lead bonus at present £4 7s. 6d. per week. Free travel to Australia. Applicant is required to have up to 8-10 years' experience in industrial plant repair, maintenance and construction. Corporate member of the I.E.E. is preferred, but Graduate member will be considered. The plant comprises a power station of 27.5 MW capacity, and extensive electrical distribution system and large and varied plant in mining, milling and smelting equipment. A large expansion programme now being undertaken includes a 30-MW power station and extensions to existing plant to give double present output. Apply—The Secretary, Mount Isa Mines Limited. Adelaide House, King William Street, London, E.C.4. 2238

ELECTRICAL contractors (Manchester area) require an experienced engineer to handle contracts from enquiry to final accounts. Reply giving full details, salary, etc.—Box 2181.

ELECTRICAL engineer required to assist in the commercial and technical development of electric control of pipeline valves. An excellent opening in a very interesting and rapidly developing field, offering full scope for initiative and opportunities later for travel at home and abroad. Familiarity with control gear or relay circuits an advantage. Preferred age range 24-30, commencing salary £650-£950 depending on qualifications and experience. Apply to—Rotork Engineering Co. Ltd., Widcombe Manor, Bath, Som. 2168

ELECTRICAL wholesalers London require order clerk for customers' telephone orders. Familiar switchgear and installation materials. —Phone Gerrard 4012 (Mr. Welfare). 2318

ELECTRICAL wholesalers require representative for S.E. London and City areas. Must have intimate knowledge of electrical trade.—Phone, BIS. 4356. 2309

ELECTRICAL wholesalers require sales assistants for branches in London area. Good wages and bright prospects for ambitious young men. Write in strict confidence giving full details, age, experience, salary required, etc., to—Box 2182.

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works. Inverness Road, Hounslow, Middx. 275

ESTIMATOR and planning engineer required for expanding company of electrical and mechanical manufacturing engineers. Good opportunity for man with some practical experience and knowledge of industrial electrical estimating. Good canteen facilities and staff pension scheme in operation.—Peppers of Woking Ltd., Stanhope Road, Camberley, Surrey. 2233

EXPERIENCED draughtsmen of O.N.C. or H.N.C. standard required for interesting design work on process plant and machinery. A good technical background and knowledge of machine design is essential and applicants should be qualified to H.N.C. standard. Salaries are assessed in accordance with age, qualifications and experience and will be reviewed annually. Contributory superannuation and widows' pension fund are in operation and there are excellent canteen, welfare and recreational facilities. Applicants should apply in writing to Group Personnel Department, Pilkington Brothers Limited, Grove Street, St. Helens, Lancs, enclosing a brief history of their career and details of their education and qualifications. 2310

EXPERIENCED lady demonstrator required by a leading electrical cooker manufacturer for the North of England. Must be willing to travel. Please apply giving full particulars of qualifications and experience in confidence to—Box 2282.

FOREMAN maintenance and installation electrician required for large factory in Kent. Must have thorough knowledge of both A.C. and D.C. control gear. Only applicants who have served in a supervisory capacity need apply. Write giving full details of previous experience and earnings. State salary required. —Box A.744, c/o Central News Ltd., Pemberton House, East Harding Street, London, E.C.4. 2253

JUNIOR estimating and contracts engineer required for expanding switchgear company. Should have H.N.C. or equivalent. Progressive position for right man. Apply stating age, salary required and experience to date to—Reference AWB, Switchgear & Equipment Ltd., Southam Road, Banbury, Oxon. 2148

LADY tracer required by electrical contractor, Victoria (London). Interesting work; permanency. Write age, experience and salary required.—Box 2166.

LONDON consulting engineers require electrical engineers for installation design for hospitals, commercial buildings, schools, etc. Write stating age, qualifications, experience and salary required to—Box 160.

MAINTENANCE electrician for general industrial maintenance and breakdowns in London area. Good rates for experienced man. Write or call — E.I. Ltd., 65, Vincent Square, Westminster, S.W.1. 2149

MINE electrical engineer. A large mining company operating in Upper Burma (climate sub-tropical and healthy) has a vacancy for a mine electrical engineer. Applicants must have experience of maintenance of mine electrical installation, both on surface and underground. Four years' agreement; six months' paid leave, of which three months normally permitted after two years; contributory provident fund; free passage, partly furnished quarters and medical attention. Commencing salary and allowances aggregate K.1,325 (£99 7s. 6d.) per month, rising to K.1,475 (£110 12s. 6d.) in fourth year. Advise fullest details education, qualifications, experience, age and family status. Write Box P.441, Willing's, 362, Gray's Inn Road, London, W.C.1. 2283

REFRIGERATION engineers, experienced (several), London and Greater London areas. High rates of salary and commission, 5-day week, transport provided.—Tel. Museum 5617 or (after 7.30 p.m.) Buckhurst 7115. 2285

REPRESENTATIVE for Yorkshire for TEMCO wiring accessories. Good salary, commission, expenses, for experienced man with personality and contractor connection. Car provided. Pension scheme. Write in confidence stating experience, age, remuneration required, to—Mr. S. M. Harris, T.M.C.-Harwell (Sales) Ltd., 37, Upper Berkeley Street, London, W.1. 2311

REVO ELECTRIC Co. Ltd. invites applications for appointment of technical sales representative for switchgear in a territory comprising the Greater London area. Essential qualifications are previous experience in this field and sound technical background. Attractive salary for suitable applicant; contributory pension scheme. Applications in writing giving full details of education, experience and salary required, which will be treated in strictest confidence, should be sent to 30, Great Queen Street, London, W.C.2. 2240

SALES engineers for S.W. and S.E. England required by well-known firm specialising in electric off-peak space heating. Applicants should be qualified in electrical engineering or heating practice. Good personality and address; aged 25/35 years. Superannuation scheme; good salary and prospects. Apply giving full details of training and experience, and whether car driver, to—Box 2254.

STOREKEEPER required for London electrical contractors; must be experienced.—Box 9253.

STORES and clerical assts. req'd. Knowledge of trade and equipment desirable. Good prospects. Pensionable.—L.E.C., Wholesalers, 92, Blackfriars Road, London, S.E.1. 2102

SWITCHGEAR sales engineer required for estimating and contracts work. Applicant must have experience of 11 kV switchgear. Previous sales experience desirable, not essential. Vacancy is at Amersham but applications for London would be considered. Five-day week, bonus and pension schemes. Apply in writing with full details stating salary required. —Sales Manager, J. G. Statter & Co. Ltd., 82, Victoria Street, London, S.W.1. 2224

TECHNICAL assistants (junior) required by industrial firm in West London. Must have qualifications to degree or A.M.I.E.E. standard and some practical experience of installation work, H.V. and L.V. distribution, modern control gear, process control method. Knowledge of electronics and illuminating engineering advantageous. Write stating age, qualifications, experience and salary required to—Box 2258.

TECHNICAL assistants required by London company specialising in electric off-peak heating systems. Applications are invited from candidates having experience of electrical or heating practice. Drawing office experience an advantage. Age 21/30. Excellent prospects. Superannuation scheme. Apply giving full particulars to—Box 2255.

TESTING staff required for telephone cable contracts in various parts of the country. Apply by letter to—Telecommunications Department, Pirelli-General Cable Works Ltd., Eastleigh, Hants. 2047

TRANSFORMER designer/draughtsman, experienced with units up to 250 kVA. Salary commensurate with experience. Bonus and free housing accommodation to suitable applicant.—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 2225

TRANSFORMER designer, experienced up to at least 1,000 kVA. Salary according to qualifications and experience. Write with full details of career and salary expected to—Box 2269.

TESTER of automatic electric control equipment required. Interesting work with good prospects. O.N.C. standard preferred. Five-day week, pension scheme, canteen facilities. Please write giving full details of age, previous experience, qualifications, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 277

TRANSFORMER technical manager required, with prospects of appointment to position of technical director. Transformer range up to 5 kVA. Works at Chislehurst, Kent. Write experience and salary required to — Pearce Transformer Company Limited, New Cross Road, London, S.E.14. 2256

TRAVELLERS required, experienced sale plastic cables. Write full details age, experience, territory covered.—General Manager, J. Day & Co., Harrow Manorway, Abbey Wood, London, S.E.2. 2257

WANTED by small firm, experienced engineer having sound practical and technical training in industrial power plant. Work includes design and redesign of rotating machinery, transformers, design and circuiting of control gear for industrial processes, small and large, technical sales, etc. Interesting work. Well paid and permanency. All replies treated in strictest confidence. Write—M.D., Fyfe, Wilson & Co., Ltd., Station Works, Bishop's Stortford. 2312

YOUNG electrical engineer required as trainee transformer designer. Practical experience of transformer manufacture preferred but not essential. Education to at least H.N.C. standard. Write with full details of career to—Box 2270.

YOUNG electrical engineer required for sales office of arc welding equipment manufacturers. Apply—Murex Welding Processes Limited, Waltham Cross, Herts. 2129

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

B.Sc., A.M.I.E.E., 20 years' experience applications motors, automatic control gear, tenders, estimates, installation, administration, seeks change.—Box 9257.

ELECTRICAL engineer (contracting) seeks senior appointment with reputable company, where drive, initiative and real ability are essential qualifications.—Box 9262.

ELECTRICAL engineer having spent the last ten years in the East desires change. Estimating, planning, supervision of power and lighting installations, power houses, factories, public buildings, o.h. & u.g. distribution systems. Prepared to travel home or abroad.—Box 9259.

ESTIMATING and supervising engineer desires change.—Box 9263.

STORES clerk (39), Electricity Board, Grade 2, seeks post in other Board with scope for advancement. Thoroughly acquainted all stores procedure to District level.—Box 9254.

TECHNICAL sales engineer (43), 20 years in Midl'ds present co., seeks change.—Box 9258

TWO electricians (supervisors) desire overseas contracts.—Box 9251.

YOUNG electrical engineer, aged 25, apprenticed, passed installation and technology exams., experienced with light and heavy electrical plant installation and maintenance, studied term of estimating on electrical work. Keen to obtain good position. London area preferred. —Box 9261.

ARTICLES FOR SALE

ELECTRIC MOTORS FOR SALE

1	40 h.p.	G.E.C.	New 1953
1	70 h.p.	G.E.C.	New 1954
1	110 h.p.	G.E.C.	New 1953
1	140 h.p.	G.E.C.	New 1954
2	125 h.p.	G.E.C.	New 1952
2	425 h.p.	G.E.C.	New 1938

(40 h.p., 975 r.p.m. Others : All 725 r.p.m.)

Also Switchgear, Capacitors and Cables.

Full details on application to :

ROYTON TEXTILE CORPORATION LTD.
Vine Mill, Royton, Oldham, Lancs.

2317

DIESEL ALTERNATOR SETS

400/440 volts, 3-phase, 50 cycles

500-kVA PETTER "SS" vertical 6-cyl. water cooled Engine. Comp. air start. BRUSH Alternator. Auxiliaries, control gear, etc. 600 r.p.m.

250-kVA PETTER "SS" vertical 3-cyl. water cooled Engine. Comp. air start. BRUSH Alternator. Auxiliaries, control gear, etc. 600 r.p.m.

187-kVA WAUKESHA vertical 6-cyl. radiator cooled Engine. Eng. start. G.E.C. Alternator. Control gear. 1,000 r.p.m.

162.5-kVA CROSSLEY vertical 6-cyl. water cooled Engine. Comp. air start. L.D.C. Alternator, control gear. 500 r.p.m.

125-kVA NATIONAL vertical 6-cyl. radiator cooled engine. Comp. air start. BRUSH Alternator, control gear. 1,000 r.p.m.

100-kVA MIRRLEES vertical 3-cyl. water cooled Engine. Comp. air start. G.E.C. Alternator, control gear. 600 r.p.m.

93.5-kVA BLACKSTONE vertical 3-cyl. water cooled Engine. Comp. air start. E.C.C. Alternator, control gear. 600 r.p.m.

68.8-kVA CROSSLEY vertical 6-cyl. water cooled engine. Elec. start. BRUCE PEEBLES Alternator, control gear. 1,000 r.p.m.

62.5-kVA McLAREN vertical 5-cyl. radiator cooled engine. Elec. start. BRUCE PEEBLES Alternator, control gear, 1,000 r.p.m.

58-kVA FOWLER vertical 6-cyl. radiator cooled engine. Elec. start. L.D.C. Alternator, control gear. 1,500 r.p.m.

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37-kVA PERKINS vertical 6-cyl. radiator cooled Engine. Elec. start. HIGGS Alternator, control gear. 1,500 r.p.m.

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14-kVA NATIONAL vertical 2-cyl. radiator cooled Engine. Hand start. B.T.H. Alternator, control gear. 1,000 r.p.m.

THOS. W. WARD LTD.
Albion Works, Sheffield
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322

MOTORS FOR SALE

Squirrel Cage, Continuously Rated

H.p.	Make.	Speed.	Encl.	
25	CROM/PARK.	960	S/P	£48
25	" "	1450	S/P	£44
15	" "	950	T/E	£38
10	" "	1440	S/P	£24
25	BRUCE PEEBLES	1450	S/P	£44
4	" "	1450	S/P	£18
5.5	L.D.C.	1450/470	S/P	£26
15	"	975	T/E	£38
15	"	720	S/P	£34
7.5	E.E.	950	T/E	£22
15	"	970	S/P	£30
5	"	955	S/P	£20
2	"	1440/72 (Geared Unit)	T/E	£28

Slipring, Half-hour Rated

12.5	L.S.E.	Speed 940	£24
15	"	" 950	£28

All 400/440 volts, 3-phase, 50 cycles, overhauled and guaranteed.

ELECTRICAL EQUIPMENTS (CARDIFF) LTD.
Tresillian Engineering Works
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2199

MOTOR GENERATOR FOR SALE

MOTOR Generator, 1,000 amps., 60 volts, 96 h.p., motor driven at 970 r.p.m., with exciter, starter for 380/400 volts, 50 cycles, 3-phase, A.C. supply. Control panel with moving coil meters and potentiometer regulator.

Dimensions : Motor generator set, 9′ 2″ × 4′ × 4′ high (weight approx. 53 cwts.). Starter (wall mounting), 31″ high × 28″ wide × 17″ projection. Control panel (wall mounting), 36″ high × 24″ wide × 18″ projection.

This equipment is new and unused.

PRICE £1,372.

W. CANNING & CO. LTD.
Great Hampton Street, Birmingham, 18

2271

BRASS ROLLED THREAD SCREWS, NICKEL PLATED AND SELF COLOUR

CHEESE HEAD

438 gr. 8 B.A. × ¼ in. N.P. per gross		1s. 3d.
584 gr. 6 B.A. × 5/16 in. S.C.	"	1s. 0d.
227 gr. 6 B.A. × ⅜ in. N.P.	"	1s. 0d.
278 gr. 4 B.A. × ½ in. N.P.	"	1s. 3d.
546 gr. 4 B.A. × ½ in. S.C.	"	1s. 3d.
563 gr. 4 B.A. × ½ in. S.C.	"	1s. 6d.

ROUND HEAD

484 gr. 6 B.A. × ¼ in. S.C. per gross		11d.
169 gr. 4 B.A. × ½ in. N.P.	"	1s. 8d.
200 gr. 4 B.A. × ½ in. S.C.	"	1s. 8d.
237 gr. 2 B.A. × ½ in. S.C.	"	1s. 9d.

COUNTERSUNK HEAD

236 gr. 8 B.A. × ¼ in. S.C. per gross		1s. 0d.
403 gr. 6 B.A. × 3/16 in. S.C.	"	1s. 0d.
527 gr. 4 B.A. × ½ in. N.P.	"	1s. 0d.
441 gr. 4 B.A. × ¼ in. S.C.	"	1s. 1d.
200 gr. 4 B.A. × ½ in. S.C.	"	1s. 4d.

The above prices are not applicable to orders less than £15 nett value.

Many other sizes available at similar terms.

Detailed list on request from :

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9243

CITY AND ROYAL BURGH OF EDINBURGH TRANSPORT DEPT.

Traction Poles for Disposal

TENDERS are invited for the following items which, due to tramcar abandonment, are now surplus to requirements.

(1) Approximately 130 Tubular Steel Traction Poles, 31 feet long, 5½″ outside diameter at top increasing by two 1″ steps to 7½″ diameter at bottom, wall thickness 5/16″.

(2) Approximately 500 Tubular Steel Traction Poles, 25 feet long, mainly 5½″ outside diameter at top increasing by two 1″ steps to 7½″ diameter at bottom, wall thickness 5/16″; remainder 6½″ outside diameter at top increasing by two 1″ steps to 8½″ diameter at bottom, wall thickness ¾″.

Form of tender can be had from the Transport Manager, 14, Queen Street, Edinburgh, 2, with whom arrangements can be made for inspection.

Offers for this material to be returned, in the official envelope supplied, not later than Friday, 28th February, 1958.

WM. BORLAND,
Town Clerk. 2259

L.T. SWITCHBOARD FOR SALE

MET.-VICK. Low Tension Switch Panel Cubicle Type Switchboard for 400/3/50, 4-wire.

2 1,200-ampere; 3 600-ampere and 3 500-ampere Oil Circuit Breakers with Ammeters, Voltmeters, Power Factor and Max. Demand Meters. Also Bus-section coupler between 1,200-amp. breakers.

ALL EQUIPMENT RATED at 25 mVA on 400-volt supply. Manufactured 1941.

WILL SELL SEPARATE.

Full details and specification from—

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ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
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3,500-kVA INDOOR TRANSFORMER

3-phase, 50 cycles, by HACKBRIDGE; ratio 6,600/11,000 volts, with tappings (2 available).

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235a, Cathedral Road, Cardiff
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ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS. Surplus to requirements on account of change in design of our generating plants. Attractive prices. 0.5 kVA to 25 kVA. Send for list and also details of our comprehensive range of diesel and petrol generator plants from 0.5 kVA to 200 kVA.—Dale Electric (Yorkshire) Ltd., Filey, Yorks. (Phone 2301-3). 2049

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

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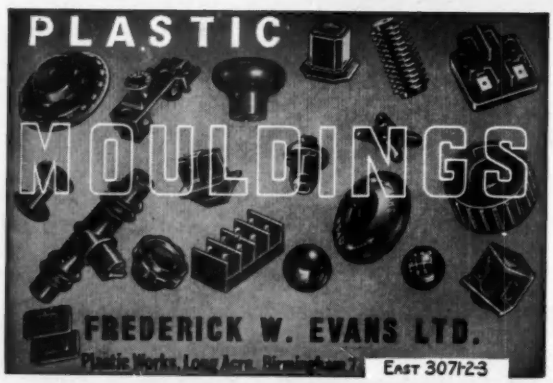

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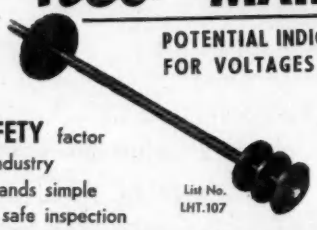

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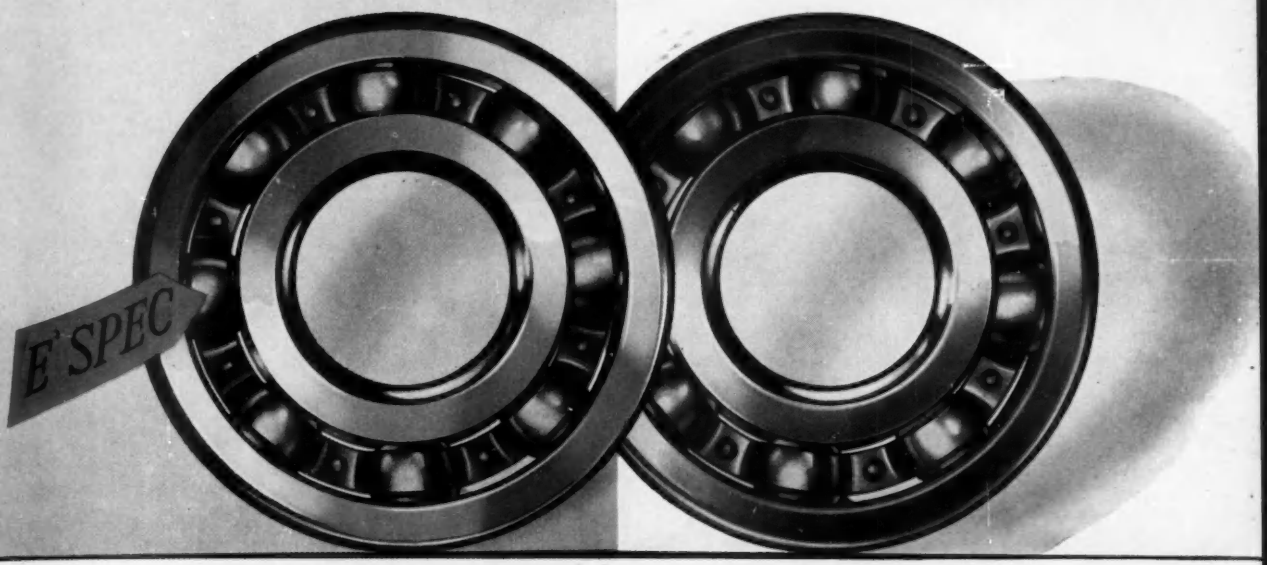

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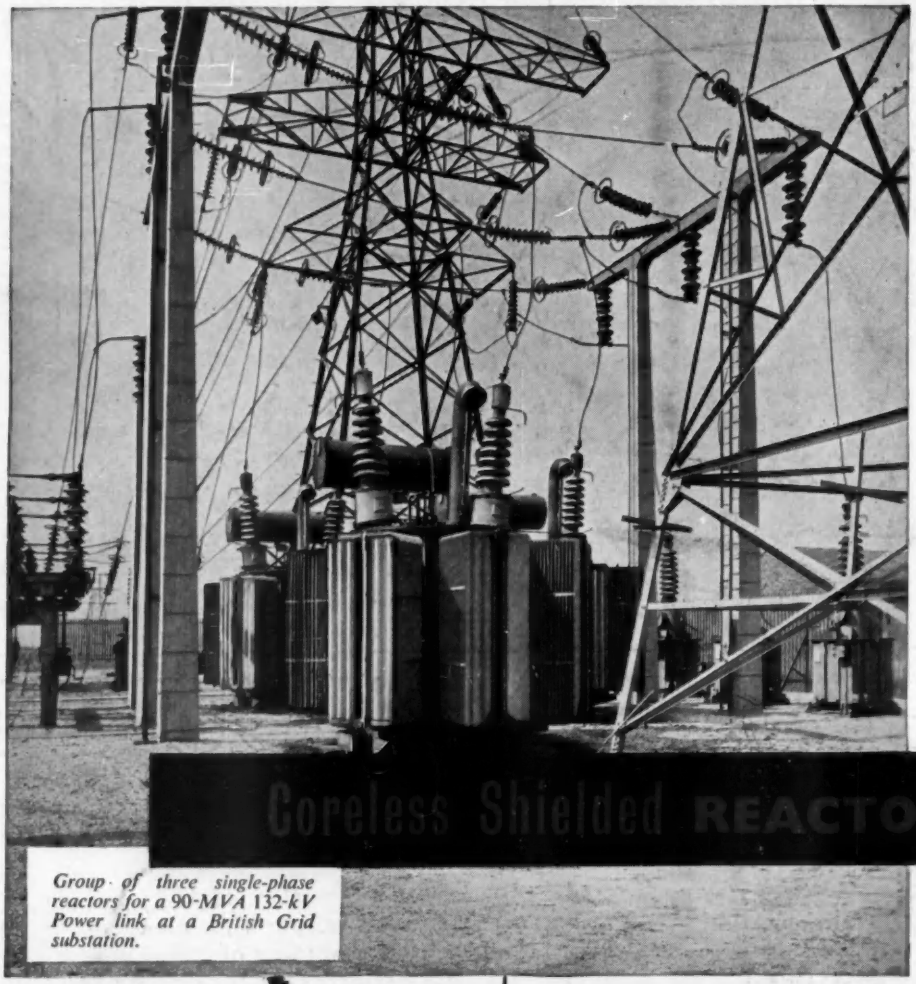

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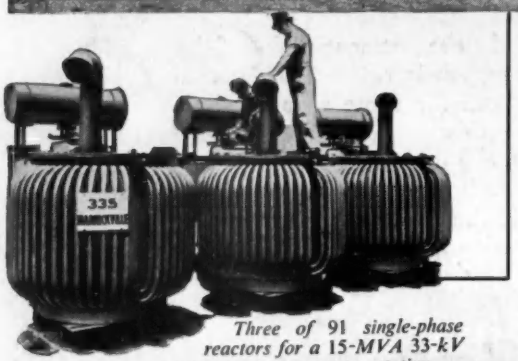

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